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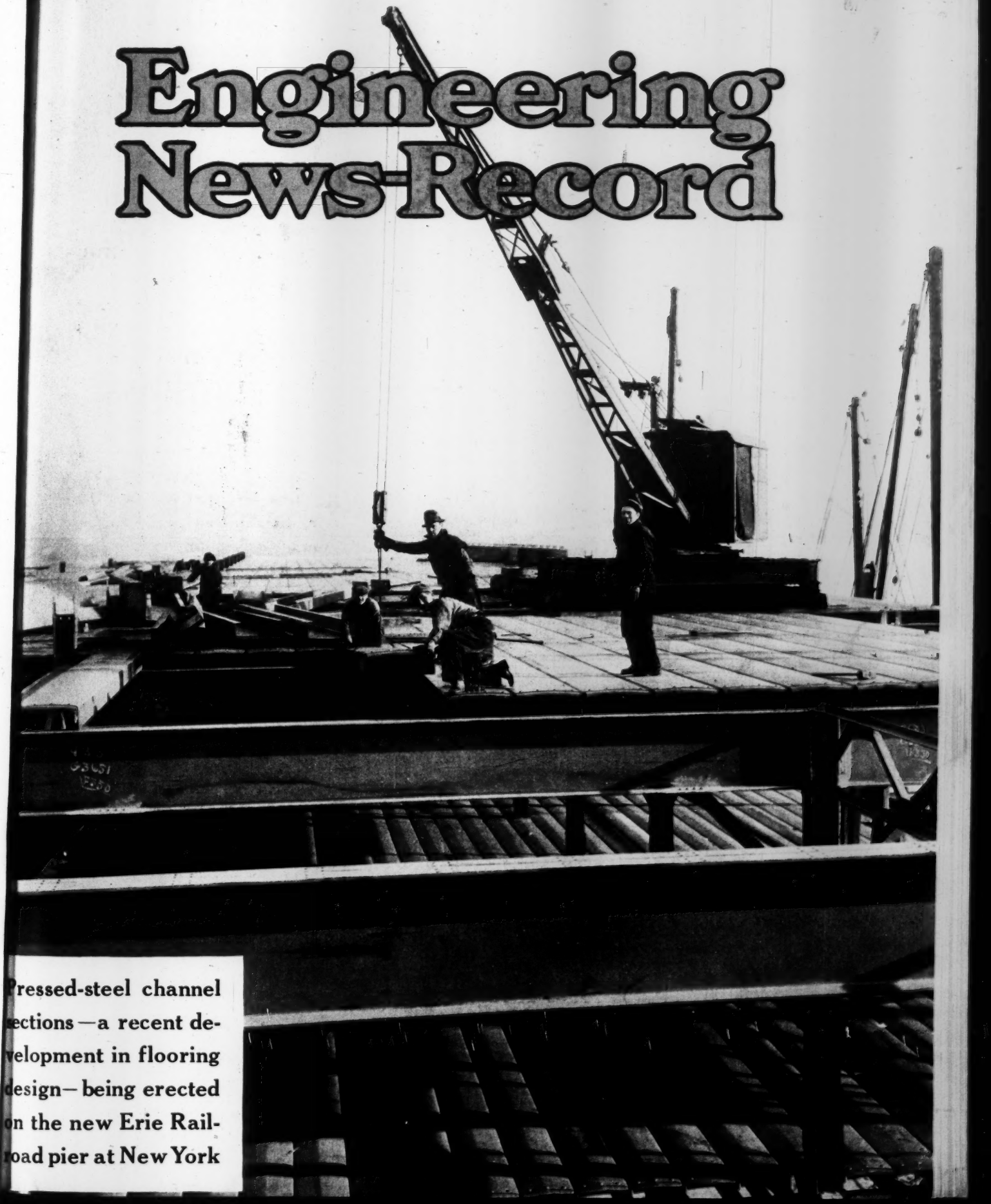

Pressed-steel channel sections—a recent development in flooring design—being erected on the new Erie Railroad pier at New York

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A McGRAW-HILL PUBLICATION — ESTABLISHED 1874

DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

F. E. SCHMITT, *Editor*

Volume 106 NEW YORK, MARCH 26, 1931 Number 13

Spring Is Here

BY THE calendar the sun last week passed through the vernal equinox. By the signs of the weather an unusually mild winter is over and an early spring is before us. Even with the utmost in nature's fickleness the season of active work is just ahead. Is construction prepared for a prompt start? The year's program of engineering and building construction is large, and its major part is fixed by definite improvement needs and is supported by authorizations and ready funds. If it is to go through without hitch or delay, every unit of the construction army—engineer, contractor and administrative official, and the legislator as well—will have to do his part with speed and energy. There has been some lagging. The first quarter's record shows contract lettings in fair volume, but barely even with last year and therefore not enough to suit the current year's greater demands. More acceleration is due if the inertia of the laggards is to be overcome. Obstacles of planning or politics can be removed in short order if everyone recognizes his share of responsibility and acts accordingly; in short, concerted effort will speed the starting of work. It is time to get construction under way, whether the project be large or small. Further procrastination can help no one and is sure to hurt the entire commonwealth.

Weld Assurance

"HOW can I know a good weld?" is the first question that every prospective user of structural welding asks. And it is the question that every proponent of welding is bending his major effort to answer definitely and satisfactorily. Visual inspection, involving observation of the operator's technique, the arrangement and shape of the beads and the condition of the edges as well as removal of sections of doubtful welds to examine interior structure, has in general proved itself entirely adequate. In the final analysis, however, human judgment must be relied on, and absolute assurance of good welding is therefore still lacking. At the meeting of the American Society for Testing Materials in Pittsburgh last week some progress was made toward supplying this assurance. Thus, an inspection method using radium provides a photograph of the inside of a weld. Unlike the well known X-ray laboratory method, it may be used in the field, a small piece of radium and a sensitized film being the only equipment required. A test meter was also described which when slid across a weld indicates on a dial any subsurface imperfections. Iron powder sprinkled on a weld was shown to collect over porous spots or cracks. Our sense of hearing is also being utilized in weld inspection through the medium of the physician's stethoscope. Compared with visual inspection, these methods are positive. They are not infallible and they are perhaps a little expensive and troublesome, but they increase confidence in welding. And confidence—weld assurance—is the prime necessity of the moment.

A Sign of the Times

SPECIALIZED technical interest shows unexpected strength when such a gathering as last week's Pittsburgh meeting of the American Society for Testing Materials brings together an attendance of more than seven hundred. Until two years ago the society limited itself to an annual meeting, but last year an interim meeting was arranged by adding a short program of special-theme papers to a group committee convention at Detroit. By its large attendance, a third greater than that at Detroit, the Pittsburgh meeting assures the continuance of these interim meetings. The event is important in its bearing on the society's internal situation, since it confirms what some have believed for half a dozen years—namely, that the interests of the large field of materials have outgrown the capacity of an annual meeting. But this very fact, together with the liveness of interest manifested in the Pittsburgh sessions as well as in the American Concrete Institute meeting a month ago, is a sign of the times in the growth of engineering cooperation. Special interests, and therefore special groups, are advancing faster than the general interests of civil engineering. The advance will doubtless accelerate as specialist societies improve their working efficiency, for not all of them operate as efficiently as the A.S.T.M. With this development, the need for cultivating the general interest of civil engineering and bonding together the profession will of course also grow — but that, as someone said, is another story.

Waste Disposal at Sea

NEW YORK CITY receives a stinging rebuke in the report presented to the U. S. Supreme Court by Edward K. Campbell, special master appointed to hear evidence in the suit brought by New Jersey to stop the pollution of her bathing beaches by garbage and refuse dumped at sea. The city adopted this means of disposal in 1918 as an "emergency" measure following an order of the new administration to close down a newly completed garbage reduction plant just off Staten Island on the ground that it was a nuisance. Shortly thereafter a commission appointed to study the problem submitted a program of plant construction sufficient to care for all the city's requirements; but, although complaints from summer resorts were frequent and bitter,

disposal capacity has continued to lag behind requirements. Enough offensive material is washed ashore to constitute, in the opinion of the special master, a public nuisance which should be abated by the issuance of an injunction, but the city is entitled to time in order to build the necessary disposal plants. This finding raises question as to what is reasonable time. A program providing for nineteen new incinerators and the reconstruction of two others, prepared by the city department of sanitation, has remained dormant for more than a year, lacking the approval of the directing authorities and the necessary financing. Unless the city soon takes the initiative, it may find itself forced into action by a Supreme Court decree.

A Big Order

THE 125,000-ton order for the structural steel of the Metropolitan Square development in New York City has been characterized as the largest single order for structural steel ever placed. Probably this is true, for, with the exception of the 70,000-ton Quebec Bridge contract in 1911, large structural steel orders have not been common until recent years. The Hudson River Bridge required about 50,000 tons, the Empire State Building in New York about 58,000 tons, the Merchandise Mart in Chicago about 50,000 tons. Such outstanding structures as the Chrysler Building and the Manhattan Company Building in New York involved respectively only 21,000 and 18,500 tons of structural steel. The size of the Metropolitan Square order is, therefore, phenomenal. In at least two important respects it has significance beyond steel circles. An order for 125,000 tons of structural steel is a reminder that building projects today are measured in units of a size considered almost impossible as recently as five years ago; also, this contract may be prophetic of a future when buildings will be planned as group developments requiring even larger material orders. The most significant fact, however, pertaining to this unprecedented order of three years' requirements of structural steel is the apparent confidence of the purchasers that present prices are as low as they will be at any time during the three-year period. The $10,000,000 they have promised to pay for the steel is a most effective measure of confidence in sustained business recovery.

Better Floors

THE past few years have witnessed unusual activity in attempts at rationalization of building design. The logic and efficiency of roof, wall and floor designs particularly have been critically analyzed. One result is a number of new flooring practices, tending toward lighter and shallower construction and in some cases toward ease and speed in erection. Lightweight aggregate of burned shale or clay and porous artificial stone have been promoted as improved substitutes for stone concrete and cinder concrete. Wire reinforcement has been added to gypsum to adapt it to structural uses. Under the impetus afforded by advance in welding technique, steel has entered the flooring field, and the so-called battledeck floor—flat-rolled plates welded to shallow I-beams — has enjoyed relatively wide acceptance. Now the manufacturers of pressed-steel products, seeing an opportunity to expand their markets, have turned their attention toward the flooring field. The adaptation of a new pressed-steel flooring section to pier shed construction is described in this issue; its effectiveness may well spur engineers and manufacturers to further effort with a view to still wider application of light floors. In tall buildings which must resist wind, consideration must be given to the functioning of the floor as a rigid flat plate, but in general the problem is merely to design a platform to carry people, equipment and manufactured products. The problem is well defined, and steady progress toward better floor design may be looked for.

Aftermath

EARLY last October a fire originating in inflammable falsework damaged the nearly completed State Education Building in Harrisburg to the extent of about $750,000. Last week the Pennsylvania Supreme Court placed full responsibility for the loss upon the contracting firm which was doing the work. An immediate receivership resulted. Now work is suspended upon all other contracts held by this company, including four major building operations totaling more than $3,000,000 in value, as well as several smaller jobs. Query: How much will the neglect of adequate safety precautions cost the contractor, his creditors and the owners of the other buildings with which he is connected?

Safety Is Worth Money

SAFETY pays dividends. Hazard to life and limb in the construction industry is reflected directly in the payment of compensation insurance, and when the industry generally displays a disregard for safety it places an increasing burden of construction finance on individual contractors—to be passed on ultimately to the public. Relief from this burden is possible only in two directions, modification of compensation laws and reduction of accidents; but it is obvious that the public and the lawmaking bodies are not likely to slacken the provisions governing workingman's compensation. The alternative puts the problem squarely up to the industry itself.

The increasing cost of carelessness is illustrated by a recent increase in the California liability rate for concrete dam construction—from $7.47 to $16.17. Such an increase of more than 100 per cent may be the incentive necessary to wake within the industry a realization of the problem. Being based on the statistics for a four-year period, it reflects not the mere effect of a few unusual accidents but a widespread condition.

During the same period the rate in the cement industry —outstanding in the practice of safety among the fields allied to construction — showed a marked decline. Steady work cannot fairly be compared with an occupation of shifting hazards and changing personnel, of course, but a decreasing accident rate does prove that cement manufacture is drawing dividends from its promotion of safety. In some cement and lime plants a single infraction of a safety rule results in immediate dismissal, and the plea of ignorance of safety rules is given no consideration. How many construction jobs show such a positive appreciation of the benefits to be derived from promoting safety?

Safety dividends can be earned also by the construction industry. Recognizable results will not be attained, however, until safety efforts are more widespread than now. The benefit of the work which a few meritorious

organizations are doing to promote safety will continue to be lost because properly trained employees drop back into old habits when moving to more negligent organizations. Meanwhile the industry pays, and pays dearly, for its failure to place a proper value on safety.

What a Survey Shows

NO SOUND reason exists for lack of confidence in roadbuilding. Greater amounts of federal money have been made available than have ever before been granted. The states generally have not curtailed highway appropriations.

Those states that report materially decreased expenditures compared with last year's are states that were then spending large bond issues and this year have returned to the use of current income. Making up for this, other states have extra funds from bond issues and federal loans.

Virtually all states are placing contracts for highway construction earlier than ever before. The amount of federal-aid funds obligated by contract to date far exceeds that for the same period of 1930.

These three statements are the outstanding conclusions from a telegraph check-up this week of the figures given by the 48 states at the beginning of the year. They are confirmed by reports from the federal government and from various national associations of roadbuilders. No curtailment of road improvement in 1931 is indicated by any wide survey of the country. On the contrary, every count that has been made indicates an increase over 1930—the greatest roadbuilding year of record.

Open-Pit Foundations

CONSTRUCTING foundations in wet, running ground by open excavation has been developed to such effectiveness during the last few years that the process has displaced pneumatic-caisson work in many important cases. The City Bank Farmers Trust Building foundation, described in this issue, is its largest application to date. It foreshadows extensive future application of open-pit excavation supplemented by drainage of groundwater.

In successive advances the drainage method has registered achievement after achievement in deep subsurface construction in both subway and foundation work in New York City. Its first use as a resource of the subway builder dates back at least fifteen years in this country; abroad the method found even earlier and more frequent use. It became general in the current work on the Eighth Avenue subway, where mile after mile of most difficult excavation, forty to sixty feet deep in fine, wet sand, was handled rapidly and safely by open work. Simultaneously the process found recognition as a valuable resource in the different field of foundation work.

Until four or five years ago it was believed that foundation piers could be sunk through the deep water-laden sands and silts of lower Manhattan Island only by the pneumatic process. Yet by aid of skillful drainage the same work is achieved today by means of either open pier wells or full-lot excavation unhindered by the water, more simply, more safely and more cheaply.

The successful development of the new foundation method in New York building construction has been rapid and in a measure dramatic. When in 1927 a new building at 39 Broadway was being planned, pneumatic caissons were found impossible because of their cost, and to avoid deep pile foundations the engineers were put to the necessity of seeking a pier foundation cheaper than caissons. The substitute devised was a system of pier wells to be put down by sinking open shafts in conjunction with drainage. To secure bidders for so radical an innovation in method, the engineers were compelled to sink a sheeted shaft to hardpan and demonstrate to intending bidders that it could be excavated and maintained by drainage. In succeeding buildings, including the Lee-Higginson, the Central Union Trust, the City Bank Farmers Trust, the Cities Service and others, the method has given unqualifiedly successful results.

The essential element of the new foundation process is groundwater drainage. Gravel well, trench-and-sump, or wellpoint drainage is applied according to conditions of ground and site—a matter of engineering skill and judgment. With proper drainage, excavation is simple under the conditions prevailing in much of the material overlying the rock of lower New York City. It is not applicable under all conditions, but it has demonstrated remarkable power and constitutes the most important step of recent times in the evolution of foundation construction.

Out of Politics

MUSCLE SHOALS may be taken out of politics, at least out of national politics, if the states of Tennessee and Alabama follow President Hoover's suggestion in his veto of the most recent Muscle Shoals bill. The President suggested that the two states set up a joint body similar to the Port of New York Authority to take over the plant.

Few people realize the present insignificance of the hydro-electric plant at Muscle Shoals, or the amount of development work necessary to make it a "second Niagara" — which many now believe it to be. The present capacity of the plant for producing prime power is in the neighborhood of 100,000 hp., about one-fifteenth of the developed prime power at Niagara, and the total installed capacity is 260,000 hp., most of which now stands idle much of the time for lack of water. The plant is designed for an ultimate capacity of 600,000 hp., but none of this theoretical power can be produced as a marketable commodity until millions of dollars have been spent in building regulating reservoirs at the headwaters of the Tennessee River. That work will require a number of years for its orderly execution.

Assuming, however, that development of the Tennessee River by a private corporation is now out of question and leaving aside discussion of the almost insurmountable financial problems involved, development by a bistate body made up of local men responsive to the needs of the region rather than to the vagaries of federal politics seems the most logical way out of the present impasse. Such a body could purchase from the federal government the Muscle Shoals water-power plant and the steam power station at Nitrate Plant No. 2 and could immediately increase the income from them by executing a fixed term contract for the sale of the power to replace the existing temporary revocable contract negotiated by the war department pending final disposition of the plant. Then, as the power needs of the Southeast grow, that body could proceed with the orderly development of the storage and power resources of the upper Tennessee.

—And the nitrate plants? They could be permitted to become a little more obsolete while Congress forgets them, and then be quietly sold for scrap.

Novel Pier Shed Construction in New York Harbor

New lightweight pressed-steel floor plates permit Erie Railroad Co. to build three-story sheds on friction piles in river silt where only two-story structures have been possible previously

By A. M. KNOWLES
Assistant Engineer of Structures, Erie Railroad Co., New York, N. Y.

NECESSITY was literally the mother of invention in the development and adoption by the Erie Railroad Co. of a new and novel type of construction for two pier sheds at its Jersey City and Weehawken terminals on the Hudson River in New York Harbor. Three special features are involved: (1) triple-story construction, the first used in New York harbor; (2) special die-formed steel-plate floors, the first of their kind ever used in construction work; and (3) dock-side elevators, the first used on the Atlantic seaboard.

The two sites selected were formerly occupied by wooden piers, destroyed by fire several years ago. The immediate demand, about the middle of 1929 when the matter was first considered seriously, was for open pier space equipped with tracks for delivery of heavy bulk freight. Such a pier, known as pier D, was built on the Hudson River at Weehawken, N. J., and put into operation Feb. 28, 1930. The design of the pier made provision for future construction of the usual two-story pier shed with steel frame, concrete floors and roof and corrugated-iron siding, and designed for live loads of 500 and 400 lb. per sq.ft. on the first and second floors, respectively. This pier had been in use only three months when there developed a demand for storage of "freight in transit," and it was decided to proceed with the construction of the shed. However, greater floor space was needed than two floors would provide, partly because of the refusal of the War Department to permit the pier to be built between the pier head lines of 1897 and 1914. This reduced the length of pier to 757 ft., and 72 ft. less than that originally planned. (The Secretary of War has since approved, on Jan. 13, 1931, a new pier head line which will permit the extension of this pier riverward when required).

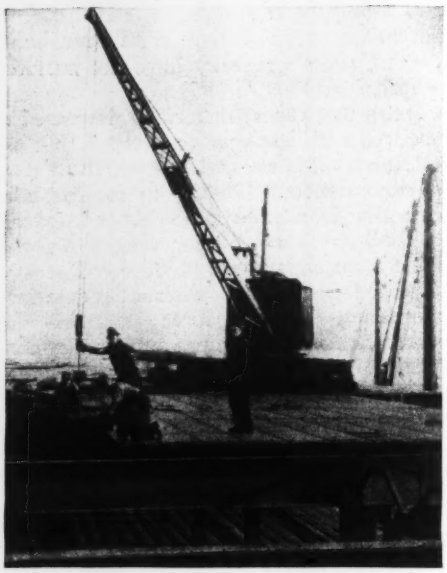


Fig. 1—Erecting a floor of pressed-steel units

Channelplates are bolted together through their webs and riveted to the building girder. Note ease of erection, that the floor itself is a working platform for the erection equipment, and that no falsework obstructs operations on the lower floors.

The other pier under consideration at about the same time was pier 8 at Jersey City. A two-story shed had also been planned for this pier, but it subsequently was

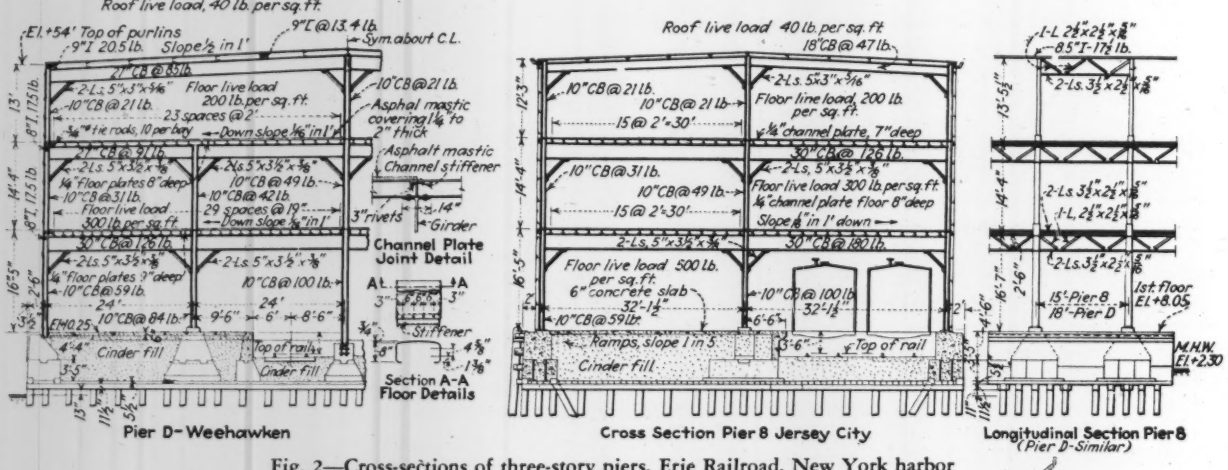

Roof live load, 40 lb. per sq. ft.
Pier D-Weehawken
Channel Plate Joint Detail
Section A-A Floor Details
Roof live load 40 lb. per sq. ft
Cross Section Pier 8 Jersey City
Longitudinal Section Pier 8
(Pier D-Similar)

Fig. 2—Cross-sections of three-story piers, Erie Railroad, New York harbor

Pier D is 757 ft. long, pier 8 1,037 ft.

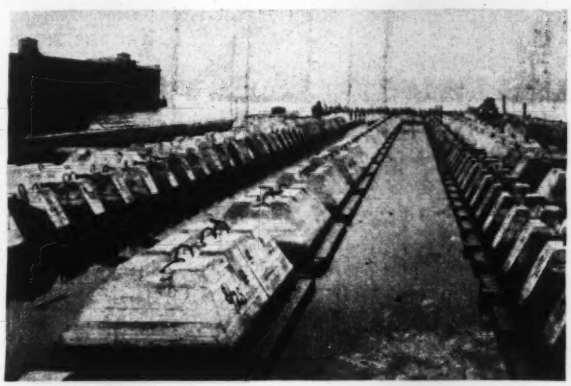


Fig. 3—Foundations below high tide level are precast
These column bases as well as the outside walls rest on a timber decking carried in turn by friction piles.

decided that the railroad company's riverfront space at Jersey City was so limited and valuable that more intensive utilization of it should be made. But here, as at pier D, the loads on the foundation were limited by the carrying capacity of the foundation piles, which depends on their skin friction in river silt.

Studies of the problems presented at these piers resulted in the construction of three-story sheds at each site, made possible by a special and new lightweight steel-plate floor construction carried on a steel frame of rolled-section columns and beams. Cross-sections of the two piers are shown in Fig. 2. Lattice struts are used longitudinally between interior columns. Spandrel beams serve as struts between exterior columns and as stiffeners for outside sections of the floor. Steel-deck roofs and corrugated-iron siding inclose the sheds. The substructure of pier D is 101 ft. wide by 757 ft. long, and of pier 8 70 ft. wide and 1,047½ ft. long. The floor areas are 97x740 ft. in pier D and 66x1,034 ft. in pier 8.

Pier Substructures—For the foundations, piles 80 to 110 ft. long were driven in rows 5 to 6 ft. centers, except under the side and end walls and interior columns where they were arranged in groups. There were 5,809 piles in pier D and 6,368 piles in pier 8, including both foundations and fenders. The foundation piles are cut off at about 1 ft. above mean low water and capped with 12x12-in. timbers on which a 6-in. splined timber decking is applied. Concrete walls around the edges of the pier, track and elevator pits and stair wells, footings for columns and fire walls were constructed upon the timber decking. The remaining spaces below the first-floor slab and tracks were filled with engine cinders thoroughly compacted. All concrete below high-water level was precast in blocks (Fig. 3). Steel reinforcement was used only in the footings for the center columns in pier 8 and here was deeply embedded. All concrete above high-water level was cast in place and reinforced. Concrete below the first floor was made especially dense to resist salt water.

A New Floor System

Perhaps the most distinctive and important feature of these two piers is the floor system utilized. Bids were first taken on a steel frame with "battle-deck" floor and roof construction for both piers. A great variation in bids resulted, due to lack of experience of contractors in welding such large floor areas and to unfavorable labor conditions. The outcome was a new type of steel-plate floor construction developed in cooperation with the Truscon Steel Co. This floor construction, known as a "channelplate" system, consists of steel plates, die-formed from the blank by a hydraulic press. This manufacturing method has developed results in accuracy of final dimensions that have contributed largely to low erection costs and increase in erection speed. Also, because of the special form of this floor system and its great strength and rigidity, a very material saving was

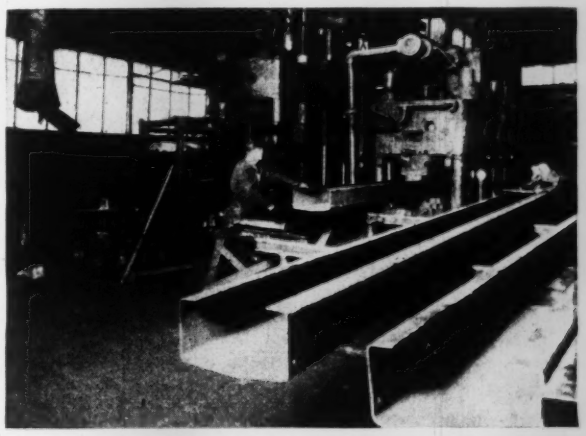


Fig. 5—Manufacturing channelplate floor sections in hydraulic press

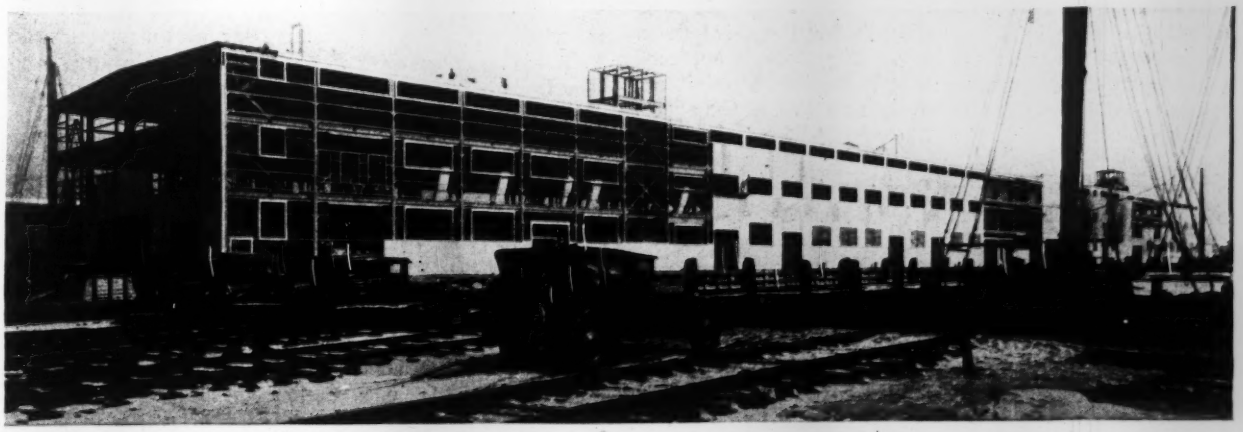


Fig. 4—The first three-story pier shed in New York harbor
Corrugated-iron siding being attached to pier D, Erie Railroad, Weehawken, N. J.

possible in the steel tonnage necessary. A special advantage of this floor construction is that it provides, immediately upon being placed, a substantial working floor, and also permits a clear space below each floor for workmen of all trades.

The vertical sides of the floor sections are bolted together to prevent one section deflecting more than the adjacent section, thus causing the mastic with which the floors are surfaced to crack. The channelplates are supported on the top flanges of crossbeams at column bents and attached by rivets through their respective flanges. Lateral support for the arch thrust of the plates is provided by the adjoining channelplates, except in the case of the outside row, where it is taken by tension rods placed near the spring line of the arches. The outside flange of the outside rows of channelplates is also riveted to the spandrel beams. In this manner the elastic deformation of the floor is greatly minimized. Provision is also made, by shop-riveted channel sections, for stiffening to top of the channelplates at the ends of the sections, and at the same time making a positive closing at the end joints.

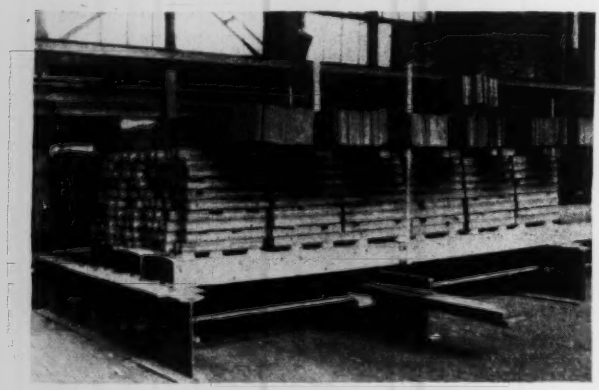


Fig. 6—Test load of 1,563 lb. per sq.ft. on channelplate sections

Removal of this load after an 18-hour period of loading revealed no permanent set, and no signs of failure were noted during the loading period.

The channelplate sections used on these piers are $\frac{1}{4}$ in. thick with bottom flanges from $2\frac{1}{2}$ to $3\frac{1}{4}$ in. wide. The tops of the sections are crowned $\frac{3}{4}$ in. On pier D the channelplate sections are 19 in. wide by 9 in. in depth for the second floor and 24 in. wide by 8 in. in depth for the third floor. They are 18 ft. long. On pier 8 they are 24 in. wide by 8 in. in depth for the second floor and 24 in. wide by 7 in. in depth for the third floor. These sections are 15 ft. long. The floor is surfaced with heavy-duty asphaltic mastic having a minimum thickness of $1\frac{1}{2}$ in. over the crown and 2 in. at the edges.

Test of Floor

Before adopting this new floor system, load tests were made on six full-size channelplate sections, $\frac{1}{4}$ in. thick, 8 in. high and 15 ft. long. The test load was applied uniformly in small increments. When it had reached 300 lb. per sq.ft. (the design load), the deflection was $\frac{3}{16}$ in. The load was increased to 1,563 lb. per sq.ft., under which the deflection amounted to $1\frac{1}{16}$ in. There was no sign of failure or overstress in any part of the section. Upon removal of this load after eighteen hours there was no permanent deflection set in the plates. Tests were run on both bare channelplate sections and on sections covered with asphalt, with similar results.

As a result of these tests the pier sheds were designed for floor live loads of 300 lb. per sq.ft. for the second floor and 200 lb. for the third floor, the live load on the first floor being 500 lb. per sq.ft.—the same as in the two-story construction. Thus the total live load was 1,000 lb. per sq.ft. of pier. This is 100 lb. more than the 900 lb. for the two-story concrete floor and roof construction first considered, and at the same time the loading on the pile foundations is not materially increased. The lighter individual floor-load capacity adopted is not considered objectionable in view of the fact that the character of the major portion of the material to be stored on these piers is such that the design loads will not be exceeded.

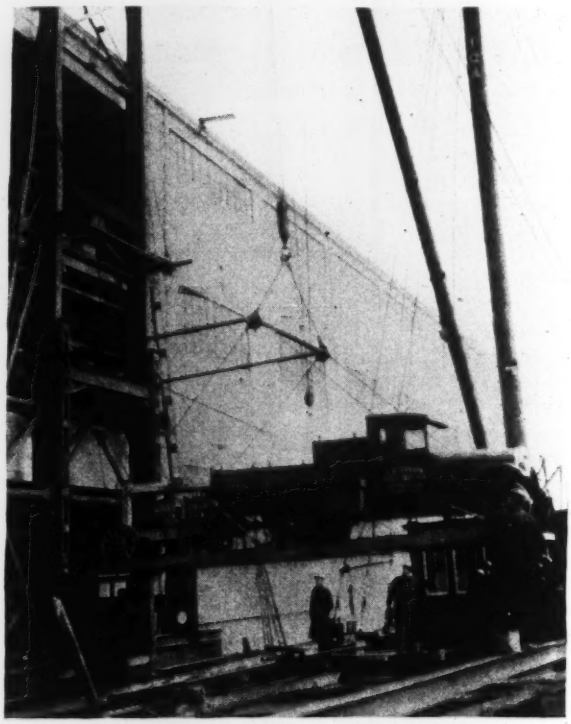


Fig. 7—Novel dock-side elevator in use

Frame against wall of pier may be moved longitudinally to any door opening. Platform is being raised by lighter tackle. View taken from deck of lighter. Elevator will be used largely in transferring automobiles on their own wheels from the pier shed to ship. Vertical adjustment permits it to be level with any shed floor or ship deck.

Each pier is equipped with two railroad tracks inside the shed extending within one bay of the full length. Pier 8 is equipped with five inside freight elevators, and pier D with four inside freight elevators and four dock-side freight elevators, serving all floors of the pier. The dock-side elevators, the first of their type in New York harbor, are novel in construction and intended primarily for the loading of automobiles on their own wheels into steamships. They are entirely outside the pier shed (Fig. 7), and their platforms are hinged at one end so that when not in use they may be folded up, in a vertical position against the sides of the pier shed. The platforms are connected with a vertical structural-steel frame extending the full height of the pier and mounted on wheels on monorail tracks along the edge of the concrete side walls of the pier. The upper portion of this frame is held by guides equipped with rollers running on the flanges of a beam protruding beyond the building line just below the third floor level.

At present the dock-side elevators are raised, lowered and moved along the pier by the ship's tackle, but provision has been made for the future installation of electric machinery on the structural-steel frame.

Both piers are equipped with steel sash and vertical lift-swing steel doors. Reinforced-concrete fire walls divide pier D into two sections and pier 8 into three sections. These walls extend from the substructure decking to 3 ft. above the roof, have wings extending one bay each way along the side walls of the pier and are equipped with double fire doors at all openings. Both piers are equipped with a pre-action system of automatic sprinklers, remote-control standpipe system and fireproof stairways.

The designs of the piers were developed by the railroad company's engineering organization: R. C. Falconer, assistant vice-president; G. S. Fanning, chief engineer; F. A. Howard, engineer of structures; A. M. Knowles, assistant engineer of structures; and Graham King, architect. Pier D is completed and was put into service Feb. 1, 1931. Pier 8 is under construction and will be completed in the fall of 1931. Both piers are built by contract under the supervision of C. H. Splitstone, superintendent of construction, A. B. Fowler and H. A. Pasman, resident engineers. The general contractors for pier D at Weehawken was Foley Brothers, and for pier 8 at Jersey City Frederick Snare Corp., both of New York City.

Field Determination of Cement Content of Paving Concrete

By H. ALLEN

Engineer of Materials, Kansas State Highway Commission, Topeka, Kan.

SEVERAL YEARS ago the writer used the method described below for determining the cement factor of concrete mixes in the laboratory, and during the past construction season the method was found to give good results in the field. Its use is limited to jobs on which proportioning is done by weight, and it is also necessary that the mixer be equipped with an accurate water-measuring device.

The equipment consists of a cast-aluminum measure with a capacity of ½ cu.ft., a platform scales which will weigh accurate by quarter-pounds, a standard tamping rod and a mason's trowel with the point rounded. The measure now used in Kansas is an aluminum casting which has been machined to size and is of the dimensions specified by the American Society for Testing Materials. This measure has proved to be very satisfactory because it is light, is much more accurate than one made of sheet iron, and it retains its accuracy since it cannot be bent out of shape.

The weight per cubic foot of fresh concrete as placed on the subgrade is determined as follows: (1) Fill the ½-cu.ft. measure one-third full of fresh concrete, rod 25 times and trowel around the edges of the measure to fill up the rod holes, avoiding any further compacting; (2) fill the measure to the two-thirds mark, rod 25 times, being careful that the rod passes through the second third of the concrete only, and trowel the edges to fill the rod holes; (3) fill the last third of the measure and heap the concrete on top of the measure, then rod and trowel as before; (4) strike the concrete off level with the top of the measure and weigh the concrete in the measure. This weight multiplied by two will be the weight per cubic foot of concrete.

YIELD AND CEMENT CONTENT OF CONCRETE PLACED IN KANSAS PAVEMENTS DURING THE CONSTRUCTION SEASON OF 1929

Mix by Dry and Rodded Volumes	Aggregate Coarse	Aggregate Fine	Water Added to Mixer, Gal	Weight Per Cu.Ft. of Concrete Lb.	Yield Per Batch, Cu.Ft.	Barrels of Cement Per Cu.Yd. — Yield Test	Barrels of Cement Per Cu.Yd. — Theoretical Calc.	Barrels of Cement Per Cu.Yd. — Cement Yardage Laid
1 : 1.75 : 3.30	1.988	1.216	27.0	152	26.2	1.55	1.54	1.58
1 : 1.75 : 3.20	1.948	1.216	27.0	151	26.2	1.55	1.55	1.70
1 : 1.75 : 3.20	1.949	1.237	27.0	151	26.3	1.54	1.57	1.67
1 : 1.75 : 3.20	1.943	1.216	27.0	151	26.2	1.55	1.55	1.62
1 : 1.75 : 3.20	1.948	1.215	27.0	151	26.1	1.56	1.56	1.55
1 : 1.75 : 3.30	1.988	1.216	27.0	153	26.0	1.55	1.54	1.53
1 : 1.77 : 3.40	1.958	1.214	23.5	153	25.6	1.58	1.57	1.56
1 : 1.85 : 3.40	1.835	1.255	25.0	149	26.0	1.56	1.55	1.57
1 : 1.80 : 3.25	1.872	1.234	27.5	151	25.8	1.57	1.55	1.55
1 : 1.82 : 3.32	1.912	1.247	28.5	150	26.3	1.54	1.55	1.56

All data are for six sack batches.

The yield or cubic feet of concrete produced per batch may now be calculated from the fact that volume

Field apparatus for determining cement content of paving concrete

of the batch is to its weight as the volume of the measure is to the weight of the concrete it contains. The cement content can be calculated from the yield. A formula for the yield may be derived as follows:

V_b = volume of the batch
V_m = unit volume of concrete (unity)
W_b = total weight of the batch including water
W_m = weight of concrete per cubic foot

Then $V_b : V_m :: W_b : W_m$

$$V_b = \frac{V_m W_b}{W_m}$$

$$V_b = \frac{W_b}{W_m}$$

The data in the table were taken at random from the records of the paving jobs done in Kansas during the past construction season. The barrels of cement per cubic yard of concrete were arrived at in the following manner: The values under yield test were determined in the manner described above, the theoretical values were calculated from the absolute-volume method used by the Portland Cement Association, and the yardage values were calculated from the actual amount of cement used, based on the assumption that the subgrade was perfect, and the theoretical cross-section was obtained.

This method of determining cement content has been very satisfactory and its use is required in the Kansas 1930 specifications for the determination of cement factors on all paving work. The test is to be made four times on each day's run when the weights of materials are kept constant and immediately after a change in the weights of the aggregates being used.

Concrete Blocks Supplant Ties in Experimental Track

TRACK CONSTRUCTION without ties, but with pairs of reinforced-concrete blocks connected by tiebars, is being tried on a practicable scale in Italy and is to be applied more extensively. Track of this type with blocks of concrete, steel or cast-iron, has been used on a considerable mileage in some countries, particularly in India; but a feature of the Italian design is that rectangular blocks are laid lengthwise of the rails and only a short distance apart, so that the design approximates a longitudinal support on the ballast.

These blocks, as shown in Fig. 1, are 44x24 in. on the base and 36x16 in. on top, the top surface being sloped transversely 1 in 20 to give the rail a corresponding

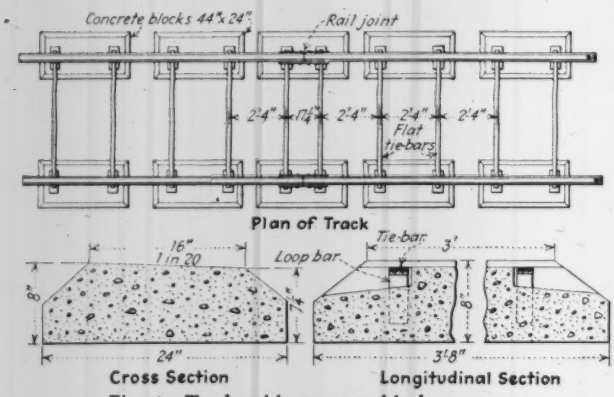


Fig. 1—Track with concrete block supports

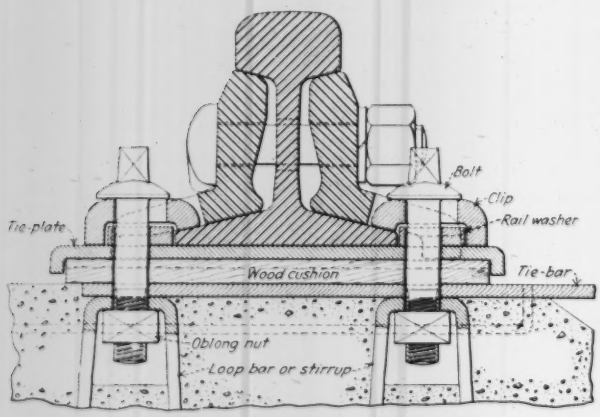


Fig. 2—Rail fastenings on concrete blocks

inward cant or inclination. Thus the thickness of 8 in. on the outer side is reduced to about 7¼ in. on the inner side. At each point of support the rail rests on a metal plate under which is a ½-in. wood cushion block 10x4½ in., which in turn is seated on the end of the flat tiebar. The fastenings, Fig. 2, consist of mushroom-head bolts which pass down through the plate, cushion and tiebar to engage nuts fitted to pockets formed in the block. A loop bar or strap embedded in the concrete forms the top of the pocket, and the nut is of oblong shape, so that it cannot turn as the bolt is screwed down. The bolt head bears on a rail clip, while a washer within the clip bears against the edge of the rail base and permits adjustment of gage.

Fig. 3—Block-making yard, Leghorn, Italy

It is reported that about 18,000 blocks have been placed on different lines in Italy since 1918, and that 32,000 are being made, these latter to be placed early in 1931. This total would be equivalent to some 25 miles of track. In addition, 5,000 blocks are being made for trial use in Germany. This track construction is the invention of O. Valeri, engineer, of Rome. The blocks are manufactured by the Società Italiana Ferrobeton, Rome.

Poisoning Trees to Make Treated Timber

A method of impregnating living trees with a poisonous compound has been developed, which is claimed to render the resulting timber immune to attacks of marine borers, termites and fungi. The treatment process, which was a discovery of Dean Lipman, University of California, results in a distribution of the solution by capillarity throughout the sapwood, killing the tree but accomplishing the treatment at a very low cost.

Briefly, the method consists of ringing the bark of the tree about 3 ft. above the ground and boring holes from this circle to the center of the trunk. Two semicircular pipes are then placed around the tree at the ring with small jets leading into the radial holes. A feed line to this pipe connects with a tank of the poison solution placed on a portable platform approximately 15 ft. high. Arrangements for providing this supply of solution may be for an individual tree or a group. The copper and arsenic compound from the tank flows by gravity into the tree trunk and is distributed by the sap into every cell of the tree. The poison is maintained in solution by a volatile solvent. This agent evaporates in a short time, precipitating the compound which becomes, literally, a part of the wood tissue.

If this treatment is applied during the spring when sap flow is active, complete distribution takes place in approximately 24 hours. However, sap flow during other seasons is sufficient to make the process effective at any time during the year within a few days. Trees so treated, when cut down, indicate the poison distributed throughout the trunk. The concentration is stronger at lower levels but is considered sufficient even at the tip to be toxic to an organism. It is estimated that this treatment can be applied to a large tree for approximately $5 or less, depending on the extent of the treatment operations.

Principal uses of the method probably would be for treating telephone poles and for piling. Tests have been made with poles in moist ground and termite-infested regions. Also, piles treated by this method have been subjected to the attack of marine borers in San Francisco Bay.

Skyscraper Foundations in Quicksand Area Built Within Open Cofferdam

Usual pneumatic caissons replaced by full-lot cofferdam for 60-story City Bank Farmers Trust Building in lower Manhattan

By GEORGE W. GLICK
Moran & Proctor, Consulting Engineers, New York City

BUILDING FOUNDATIONS in the quicksand area of lower Manhattan, New York City, have long been built with the use of pneumatic caissons. Recently several projects have been carried through by the full-lot open-cofferdam method. The latest example of this type of construction, used on the recently completed 60-story City Bank Farmers Trust Building, is of interest from both an engineering and construction standpoint as successfully competing with the pneumatic-caisson method. This structure, because of the unusual demand for basement space, presented a number of interesting problems in foundation design and construction. These problems were complicated by a fast building program, as the foundation construction was scheduled to start early in September, 1929, and the building was to be completed early in 1931. Six months was the limit of time which was allotted for the foundation construction. Another feature of the foundation work was the use of concrete delivered to the job ready mixed and designed in accordance with strength specifications.

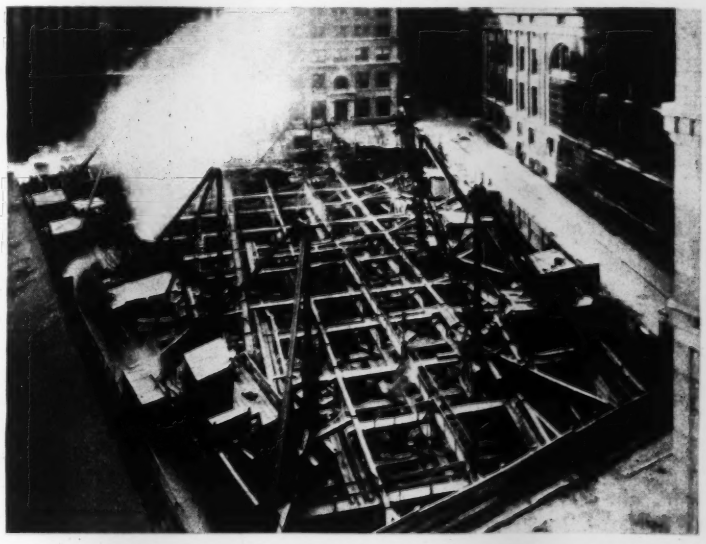


Fig. 1—Full-lot open cofferdam, City Bank Farmers Trust Building

Lower Manhattan Foundation History

Beginning in 1893, when the caisson foundations for the Manhattan Life Building at 66 Broadway were constructed, up to 1928, practically all of the heavy foundations to rock in this locality had been constructed by the pneumatic-caisson method. The soil formation throughout the territory is generally a very fine sand, frequently of the character of quicksand, extending either to a layer of hardpan directly over ledge-rock, or in many cases, directly to rock. Groundwater level is generally found 3 to 7 ft. above mean high water in the adjacent harbor.

In 1928 the foundations for the Harriman Building at 39 Broadway and the Lee-Higginson Building at 35 to 39 Broad Street were constructed to rock by open methods. Both of these jobs demonstrated the possibility, as well as economy in time and money, of building cofferdam walls and piers to rock in this locality without the use of compressed air.

The cofferdam walls for the City Bank Farmers Trust Building were designed to be built completely around the property in steel-sheeted cofferdams driven to rock or to the hardpan immediately overlying the rock. The depth of earth over the rock varied around the lot from 35 to 42 ft., the last 3 to 5 ft. above rock being hardpan into which the steel sheeting could be sealed.

The site of the City Bank Farmers Trust Building, on the block bounded by Exchange Place, William, Beaver, and Hanover Sts., was formerly occupied in the westerly portion by the Farmers Loan & Trust Co., while the easterly portion was occupied by a building owned and occupied by the Canadian Bank of Commerce (Fig. 2). The buildings of the Farmers Loan & Trust Co. were wrecked during the summer months of 1929, but access to the Canadian Bank of Commerce building for the start of demolition was not gained until Sept. 1, so that this portion of the demolition delayed the foundation construction over the easterly half of the site.

The street levels surrounding the property vary from El. 12 to El. 17 (datum mean high water), and groundwater was found approximately at El. 3. Numerous borings taken over the site indicated that rock would be found generally at El. —17 to El. —20, dipping down at the southwest corner of the property to El. —31. Rock was almost entirely overlain by a few feet of hardpan, above which was very fine sand locally classified as quicksand and containing a slight amount of clay. Crossing the central portion of the lot were the pneumatic-caisson walls forming part of the foundations of the original Farmers Loan & Trust Co. building, these caissons extending also along Beaver St. and Exchange Place. The caissons crossing the center of the lot were removed by the foundation contractor as a part of the general excavation on the site, but those on Exchange Place and Beaver St. were left to be utilized as part of the foundations for the new building.

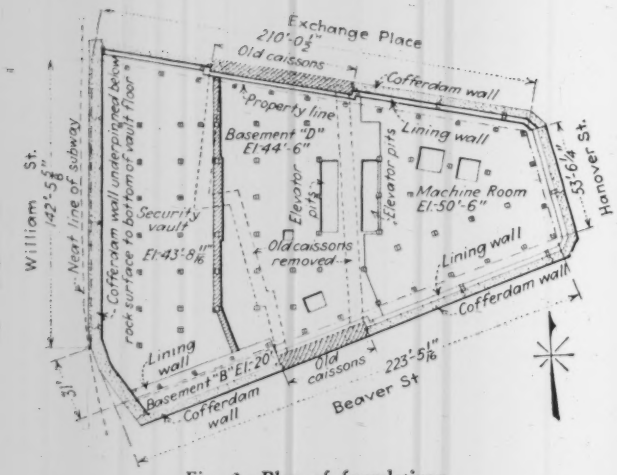


Fig. 2—Plan of foundations
Showing William St. subway and location of old caissons.

The cellar space requirements of the new building demanded four basements below the street floor, each about 25,000 sq.ft. in area, the lowest of which was generally at El. —44.5, with a machinery-room floor occupying the easterly third of the area carried to El. —50.5. These basements extended from the William Street building line to the Hanover St. curb line and from the Beaver St. curb line to the Exchange Place curb line.

The basement construction necessitated a reinforced-concrete cofferdam wall to rock extending along the William St. building line and along all other curb lines, below which was required a lining wall to surround the entire basement to subgrade level after an average depth of 34 ft. of ledge rock had been removed (Fig. 4). The westerly portion of the two lowest basements was occupied by a two-story security vault extending across the entire building on William St. Since the cofferdam and lining walls in that area of the building were to be utilized as exterior vault walls, the construction was complicated by the presence of heavy steel reinforcement used as vault protection.

Along the William St. front of the property the old buildings had been underpinned with pipe piles and concrete walls at the time of the construction of the William St. subway. Because of the possible difficulty of completing the William St. wall by open methods provision was made to install a concrete deck, if required, within the steel-sheeted cofferdam, so that the excavation could be completed and the lower part of the concrete placed under compressed air. No provision was made for the use of compressed air along the Beaver St., Hanover St. and Exchange Place fronts.

The foundation contractor started work on Sept. 5 and carried the general excavation and removal of old foundations to El. 0.0 on the westerly side of the property, simultaneously driving the exterior line of steel sheetpiling for the cofferdam. Entrance to the easterly side of the lot could not be gained for another two or three weeks because of the delay in wrecking the Canadian Bank of Commerce building. While the general excavation was progressing, the contractor made a series of explorations along the William St. subway and found that the concrete underpinning walls were entirely free from the subway construction and had not been carried to the previously anticipated depths. He then proceeded with the open-cofferdam type of construction, beginning at a point on Williams St. where the borings indicated a sand stratum in the hardpan, as this, if extensive, might require pneumatic operation. This first cofferdam unit was carried to rock without difficulty, and the same method was continued entirely around the site. Compressed-air methods were not required.

Cofferdam Design

The cofferdam construction (Fig. 5) consisted of two lines of light-weight steel sheetpiling set up and driven by crawler cranes operating from the streets. The sheeting was braced with 8-in. H-beam walers and separating struts of 6-in. H-beams spaced about 7 ft. horizontally. The walers were set from 4 to 6 ft. apart vertically, depending upon the depth of the excavation. The trench itself was made sufficiently wide to allow the construction of forms for the inside faces of the walls, while the steel walers for the outside of the cofferdam were

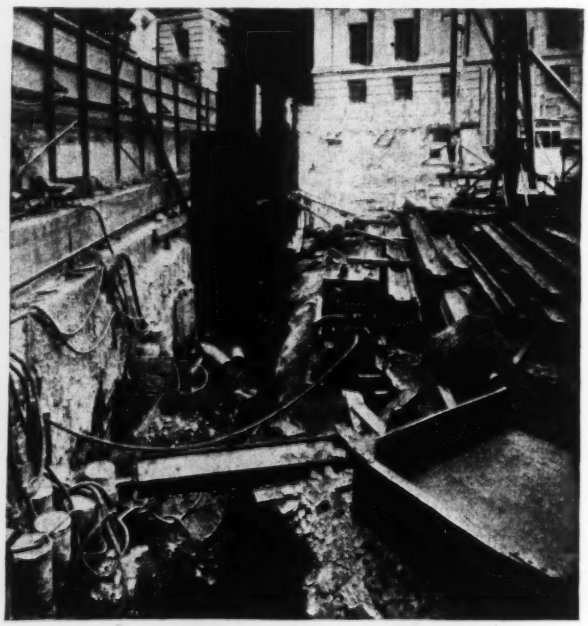


Fig. 3—Start of cofferdam on William St.
Subway wall is shown directly under fence at left. Concrete ledge at left is incasement of sewer. Concrete underpinning and pipe piles of original buildings in foreground.

concreted into the walls. Reinforcing steel for the outside faces of the walls was placed just clear of these walers.

Excavation inside the cofferdams was done by hand, the dirt being loaded into buckets which were hoisted to the surface and dumped into trucks or loading hoppers. A total of eight stiffleg derricks arranged about the lot provided all the handling equipment for dirt buckets, timber and other materials (Fig. 1).

At the beginning of the excavation the contractor installed a few well points along the westerly side of the lot to lower the groundwater to the rock line. It was found, however, after a short period of pumping, that very little water was coming from the wells, and this method of unwatering was abandoned. During the rest of the job, water was pumped from cofferdam boxes or from various sumps located over the site, using ordinary pumping equipment—the flow of water at any point being insignficant. No trouble was experienced in keeping the fine material in the cofferdam boxes sufficiently dry to excavate by hand in the open. When uncovered the rock proved to be an excellent hard mica schist with

very little decomposed rock at the surface. The bearing surfaces for the concrete cofferdam walls were leveled up on the rock, being stepped where necessary, in one case to a depth of about 7 ft. Before placing concrete in the steel-sheeted cofferdams, channel drilling for several feet in depth was completed as a start for the basement lining walls below.

After the completion of the channel drilling in the excavated boxes the forms for the inside faces of the walls were constructed, reinforcing steel placed for both faces of the walls, and concrete was placed. In the concrete walls adjoining the security vault a special arrangement of reinforcing was used in vertical and horizontal layers for protection purposes.

During the construction of the cofferdam side walls to rock, steam shovels removed the general excavation within the lot to about El. 0.0. Below this level and after the cofferdam walls were completed, excavation was continued with small air and electric shovels, as well as by hand, material being mucked into skips which were hoisted to the surface by means of derricks.

Cross-Lot Bracing

Cross-lot bracing was started when the general excavation had reached El. 0.0, and the concrete cofferdam walls were completed to rock, and thereafter bracing was gradually installed as excavation proceeded. The timbering consisted of 12x12-in. Douglas fir extending entirely across the lot longitudinally and transversely, spaced about 20 ft. on centers horizontally and arranged in three tiers at El. 1.5, El. —7.5 and El. —17 (Fig. 4).

The upper two tiers consisted of two 12x12-in. timbers bolted together, while the third tier was composed of four 12x12-in. timbers. At all intersections the timbers were posted between tiers and thoroughly tied vertically with angle-iron yokes and tierods. Diagonal lacing of 3x12-in. timbers bolted to the second and third tiers of bracing formed a series of rigid trusses running the entire length and width of the lot. Below the third tier the intersections were posted to rock, the posts being "fleeted" down as rock excavation progressed. The truss system was designed so that the weight of the timber-bracing system could safely span across any bay in case a post should be knocked out, providing the double advantage that occasional posts could be removed to facilitate the excavation and the accidental shooting out of a post would not endanger the bracing system. Each line of horizontal timbers in the bracing system was provided with steel wedges and wedging plates at each end of the line, and all timbers were stressed by means of double wedging as the installation proceeded.

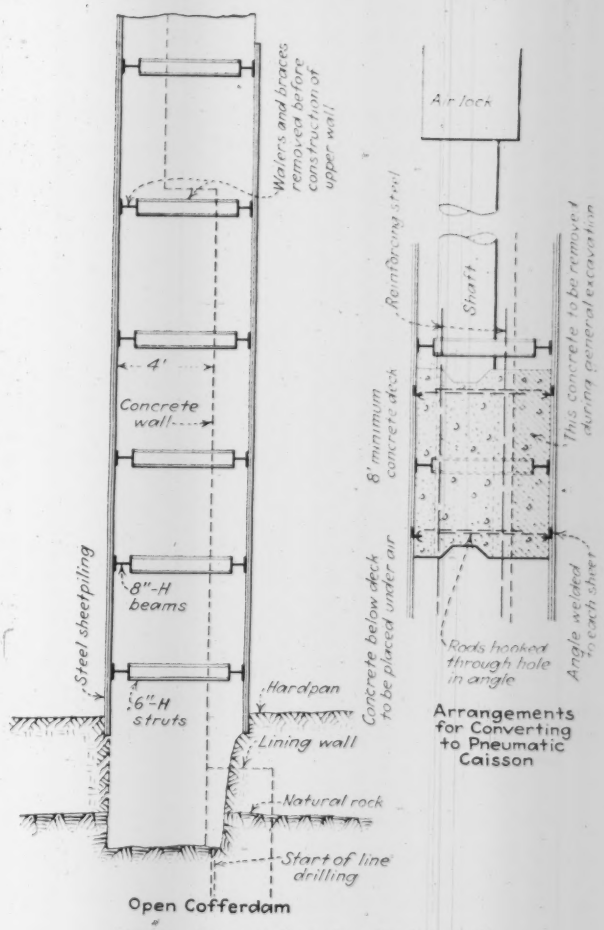


Fig. 5—Cross-section of cofferdam wall

Diagram at right shows arrangements for converting to pneumatic caisson if required.

Early in December rock was uncovered over the entire area, and the bracing system had been completed and wedged down to the rock line. The rock excavation was then continued under the bracing system, the contractor operating three eight-hour shifts per day. To prevent shooting outside the construction lines, the ledge was line drilled around the entire periphery of the base-

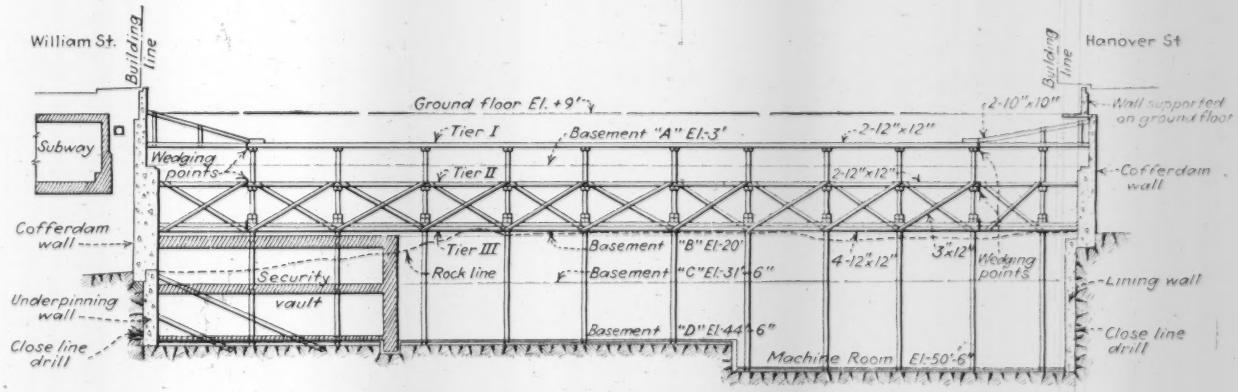


Fig. 4—Longitudinal section through foundations, showing timber bracing

Bracing was located to provide minimum interference with steel erection.

ment area. The character of the rock around the side walls of the excavation was constantly watched to anticipate any possible slipping of the rock which was supporting the superimposed concrete retaining walls. All of the rock proved to be of excellent character, and no slipping occurred at any point, so that no bracing, except an occasional spur, was required for the rock excavation below the lowest of the bracing system. Within six weeks after the start of the rock excavation, basement subgrade was reached and approximately 28,000 cu.yd. of rock had been removed from the site. The average 24-hour performance during this period was about 800 cu.yd. of solid-rock excavation. Much of the mucking was done with one air-operated and two electrically operated shovels of the tunnel-mucking type, operating under the bracing system.

As rapidly as rock excavation reached basement subgrade, the lining walls, about two stories in height, were constructed against the rock walls. Along the William St. side the lining wall was about 3½ ft. thick, being directly under the superimposed retaining wall. Around the rest of the basement the lining walls were 2 to 2½ ft. thick and were entirely inside the lines of the superimposed walls.

Drainage System

To take care of the possible accumulation of water outside the lining walls and under the lowest basement floor, both during construction and after the work was completed, a drainage system was provided. Brick chimneys were constructed in the lining walls against the rock, located approximately 20 ft. c. to c., and particularly at points where any considerable seepage of water was present (Fig. 6). From the bottoms of these chimneys, pipes delivered the water into a crushed-stone drainage course, 8 to 12 in. in thickness, spread over the entire subgrade level (Fig. 7). Additional drainage tile was placed at 5- or 6-ft. intervals under the bottoms of the lining walls to relieve any water which might accumulate around the bottoms of the walls. Permanent vertical shrinkage joints were provided in the lining walls at certain intervals around the basement, and at each of these joints vertical drainage chases were placed to collect water seeping through the joints. At the bottoms of the chases drainage tile was extended into the crushed-stone drainage course under the floors. In addition to the provision for draining water from walls and floors, all lining walls below the original rock surface were designed to withstand full hydrosatic head, as a measure of safety in the event certain parts of the drainage system should become plugged.

Pockets were excavated in the rock below subgrade level for elevator pits, sump pits, grillages and billets. All these pits were lined with reinforced concrete, the interior of which was waterproofed with cement-plaster waterproofing. Around columns the cement-plaster waterproofing was extended 6 in. above the finished floor level on the column fireproofing.

On the completion of lining walls and pits the entire basement subgrade was cleaned of all rubbish and débris and covered with a drainage course of gravel or crushed stone ranging from ¾ to 1½ in. in size. The top of this drainage course, after being graded, was covered with a waterproofed paper before depositing the concrete floor slab.

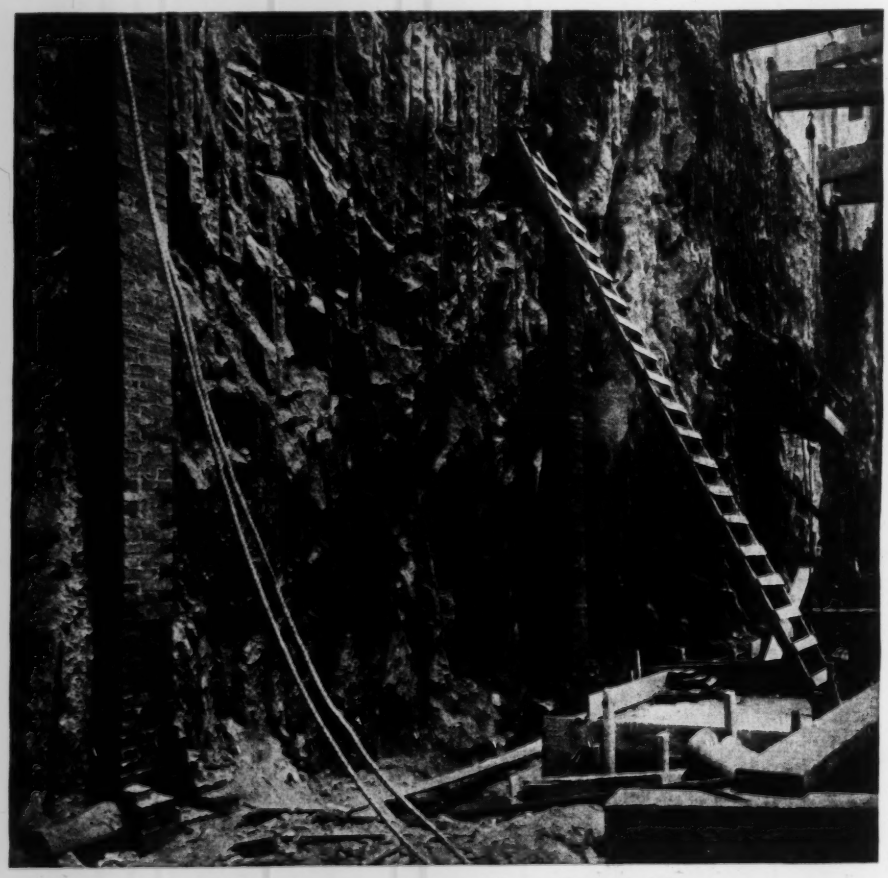


Fig. 6—Exposed rock face below cofferdam wall
Brick drainage chases will be incased in basement wall.

In order to reduce the amount of pit excavation in rock, which was important from the standpoint of time, steel billets were used under columns wherever possible, and 3,000-lb. concrete was used under column billets and grillages. The largest steel billet was a slab 12¾ in. thick and 9 ft. 8 in. square. Steel billets and grillages under columns were grouted in place with a 1:1 cement grout, which was flushed to a height of 3 or 4 in. above the under side of the steel. The billets and grillages were then entirely incased in stone concrete and waterproofed with cement plaster.

The entire surface of basement floors and pits together with the interior surfaces of all basement walls were given a cement-plaster waterproofing coat to provide a structure completely waterproofed from the basement floor to the curb level. The cement-plaster waterproofing was applied in one layer 1 in. thick on horizontal surfaces and two layers having a total thickness of

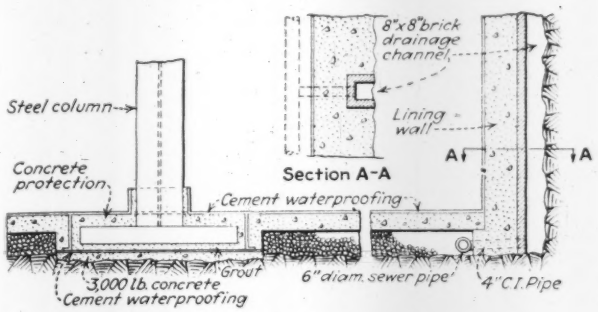


Fig. 7—Section through basement floor, showing drainage facilities

about ¾ in. on vertical surfaces. All grillage and beam pockets occurring in side walls and belts at the various floor levels were waterproofed before the steel and floor construction reached their positions.

Concrete for the work, except for the piers under interior columns, was specified to have an average strength of 2,400 lb. per sq.in. in 28 days, as indicated by crushing tests of 6x12-in. cylinders, with 6½ gal. per sack as the maximum amount of water to be used. The consistency of the concrete as placed was controlled to approximately a 6-in. slump for heavier work and 7- to 8-in. slump for thin sections.

Transit-Mixed Concrete

All the concrete was proportioned and delivered to the work in truck mixers. The concrete company maintained a laboratory at its plant with a concrete technician in charge of the designing and proportioning of all concrete mixes. All materials were proportioned by weight, the dry materials being delivered to the mixer trucks, with the exact amount of water required for the charge in a separate water tank. The mixer trucks transported the dry ingredients and the water to the job, the dry mixing continuing during transit. When the truck arrived at the job, or shortly prior to that time, the water was introduced to the batch, and mixing continued until the entire mass was homogeneous. From 5 to 10 minutes of actual mixing was usually obtained before the batch was discharged at the job.

The quality of the concrete delivered was excellent and satisfactory. The strength of the concrete, as indicated by the crushing of test cylinders, was generally uniform and up to the specifications requirement. Furnishing of ready-mixed concrete to this work was a decided advantage to the contractor, owing to the very restricted working space at the site, which would have made the installation of a local mixing plant and the handling of aggregates and cement a difficult matter. The concrete in the side walls was practically all discharged from the trucks into chutes which led directly to the forms, thus saving a large amount of the usual labor of placing the concrete.

Condition of Old Caissons

In the excavation and removal of the old caissons under the original Farmers Loan & Trust Co. building several features of this early construction were disclosed. These caissons were sunk in 1909 by the pneumatic method, the cutting edges being carried well into the hardpan and excavation being continued under air to hard rock. The walls of the working chambers were constructed of 8-in. timber while the roofs were of concrete. The timber sides of the working chambers were anchored to the concrete construction, and the entire caisson was reinforced on the inside face with 1-in. round rods, 18 in. on centers, extending the entire height of the pier and anchored into the working chambers by eyebolts with bent rods. The concrete in the old caissons generally was dense, hard and of a very high quality, showing no deterioration or damage by underground conditions except for portions within the working chambers. The concrete in the extreme ends of the chambers had apparently been mixed dry and placed in benches by hand. Much of this concrete was very porous and soft, probably never having been of good quality. The soft concrete in portions of the working chamber fill may or may not have suffered by the action of groundwaters, as its porous character would invite such trouble. Concrete in the chambers directly below and adjacent to the shaft was hard and sound. Along Exchange Place and Beaver St., where the original caissons were utilized, a considerable amount of concrete in the working chambers was removed and the space refilled with new concrete to insure a safe foundation for the new building.

The foundation contractor commenced work early in September, 1929, and the work was practically completed on Feb. 1, 1930, on which date the steel contractors entered the site and started the placing of column grillages and the erection of steelwork. It is felt that this is indeed a record for work of this character carried on under unusual conditions and speaks highly for the cooperation which existed.

Contractors

The firm of Cross & Cross, as architect, was in full charge of the work for the owners. Moran & Proctor, New York, was consulting engineer on the foundations, and H. G. Balcom, New York, was structural engineer for the steel design. The general contractor for the entire structure was the George A. Fuller Co., who awarded the foundation contract to the Thomas Crimmins Contracting Co.

New York City's Public Works Program

General improvements under way or definitely projected by the city of New York aggregate $2,079,972,600 in estimated cost, according to a report recently prepared by Comptroller Berry. The projects which make up this total, some of which will extend over a period of years, are those to be financed by bond issues only and do not include any work to be paid for from budget funds, tax notes, special revenue bonds or assessments. A condensed list of proposed improvements, showing the more important items only, is as follows:

	Total Cost to Complete	Authorized to Dec. 31, 1930	Estimated Payments in 1931
Rapid-transit construction:			
Improvements to present lines	$6,130,800	$6,130,800	$2,500,000
Independent system, first step	620,000,000	485,631,973	140,000,000
Independent system, second step	600,000,000	.....	.....
Board of Water Supply:			
Delaware River watershed	273,000,000	.....	500,000
Yonkers-Brooklyn tunnel	64,000,000	64,000,000	18,000,000
Department of Water Supply, Gas and Electricity	32,302,000	17,641,000	8,000,000
38th St. vehicular tunnel	86,000,000	500,000	500,000
Narrows vehicular tunnel	78,000,000	200,000	500,000
Triborough bridge	32,000,000	8,000,000	5,000,000
Board of Higher Education	22,742,000	7,284,400	3,500,000
Board of Education	117,000,000	56,604,400	35,000,000
Department of Hospitals	41,605,000	26,450,000	8,500,000
Department of Docks	25,565,000	6,652,750	5,000,000
Department of Sanitation	10,960,000	10,960,000	2,000,000
Totals, including minor items not listed	$2,079,972,600	$734,969,123	$257,700,000

Disposal Studies for Milk-Products Waste

By E. F. ELDRIDGE
Engineering Experiment Station, Michigan State College, East Lansing, Mich.

INCREASING DEMAND for a check upon stream pollution is concentrating attention upon methods of treating industrial wastes, because such waste products frequently introduce problems which cannot be satisfactorily met by the purification methods developed for ordinary domestic sewage. Wastes discharged from milk-products plants frequently introduce such special conditions. When located in large cities milk-products plant wastes form so small a part of the total sewage as to require no special attention, but when located in such small communities that their wastes form a considerable part of the total sewage or when, as is generally the case, the plants are on small streams in rural districts, special methods of treating the waste products have been found necessary. The studies reported in the following paper were made with the object of meeting the latter condition. They should be of value to those faced with similar problems. —EDITOR.

STUDIES of the treatment of milk-products waste were begun early in 1928 by the Michigan engineering experiment station. After about two years of observation of the more important methods of waste treatment, we have concluded, along with many other workers in the field, that primary biological filtration is the most promising method of any yet devised. Fair-sized experimental filters have reduced the unstable material in raw-milk waste by as much as 93 per cent. The effectiveness of the treatment was found to depend upon

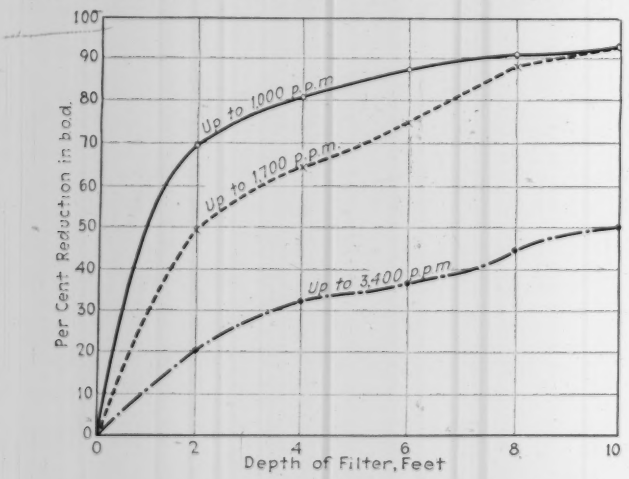


Fig. 1—Effect of depth of filter on bio-chemical oxygen demand of milk wastes

a careful control of the strength and character of the waste applied, a factor which largely accounts for the lack of success with this method of treatment in the past.

The Equipment and the Waste—The experimental units used for the studies consisted of a storage tank, orifice box, dosing tank and filters of gravel, cinders, sand and brush. The gravel filter was 10 ft. in diameter and 10 ft. deep and was composed of 1½- to 3-in. stones. Dosing was accomplished by means of a revolving-arm sprinkler. The sand filter was 30 in. deep and was dosed by means of a bucket graduated to deliver a measured quantity. The other two filters were each 4 ft. square and 8 ft. deep and were dosed by a tipping trough.

The waste was supplied by the college dairy which manufactures practically all types of dairy products. This waste, as it came to the experimental plant, was typical of that produced by the majority of milk-products manufacturing plants. It consisted of the washings from the cans, bottles and equipment, spillage from the floors, whey from the manufacture of cottage cheese and casein, and some skim milk and buttermilk. The milk losses through washings and spillage averaged between 1½ and 2 per cent of the 8,000 lb. of milk handled daily. The whey amounted to about 900 lb. per day. The quantity of skim milk and buttermilk could not be estimated, as it varied from day to day.

To get a better understanding of the constituents of milk waste, an analysis was made of five samples each of whole milk, buttermilk, skim milk and whey. From these results (see table) the percentage dilution of the various wastes from the original product can be estimated. For instance, it will be shown later that the maximum strength of wastes to be applied to the filters is about 1,700 parts per million (p.p.m.) biochemical oxygen demand (b.o.d.). This is approximately represented by solutions of 1.66 per cent whole milk, 2.11 per cent skim milk, 2.65 per cent buttermilk and 5.3 per cent whey.

Procedure—The wastes were pumped into the storage tank, where mixing gave a more uniform waste than would have been possible direct from the sewer. Samples of the raw waste were taken every hour and composited for the daily sample. The wastes were applied to the filters at the rates of 50,000 to 250,000 gal. a day (0.05 to 0.25 m.g.d.) for the sand and 0.5 to 1.5 m.g.d. for the other three mediums. Hourly samples were taken from points located at the various depths of each of the filters except the sand, which was not provided with intermediate sampling points.

The samples from each of these points were composited and analysed for the biochemical oxygen demand, oxygen consumed, pH, total solids, nitrites and nitrates. The pH determinations were made by means of a quinhydrone hydrogen-ion concentration apparatus. All others were made as recommended in "Standard Methods of Water Analysis," A.P.H.A., or modifications of these where changes in procedure were found necessary.

The filters were operated and observed for five months. Occasional changes were made in design and rates of application when such seemed to be advantageous. Dur-

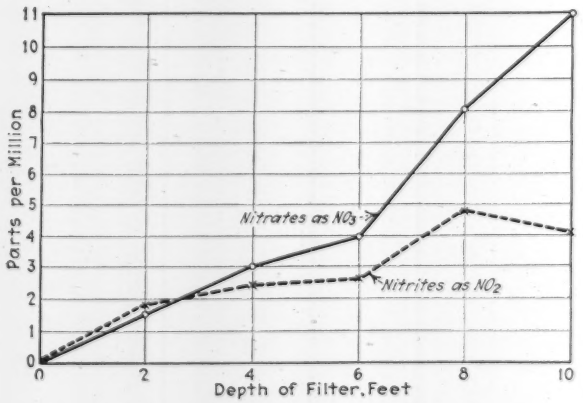


Fig. 2—Nitrite and nitrate content of effluents from milk filters

ANALYSIS OF WHOLE MILK AND SOME BYPRODUCTS

	Whole Milk, Per Cent	Skim Milk Per Cent	Butter-Milk, Per Cent	Whey, Per Cent
Total solids	12.5	8.23	7.75	7.20
Organic solids	11.7	7.45	6.88	6.40
Ash	0.8	0.78	0.87	0.80
Fat	3.6	0.0	0.50	0.40
Sugar	4.5	4.60	4.30	4.40
Protein	3.8	3.90	3.60	0.80
B.O.D. (5-day), p.p.m.	102,000	73,000	64,000	32,000
Oxygen consumed	36,750	32,200	28,600	25,900

ing the final month (July, 1929) the maximum conditions seemed to have been reached. The following observations and conclusions are based largely upon the results of this month's operations.

Filtering Mediums—Gravel or crushed stone of about 1½- to 3-in. grade makes the best filtering medium. One of the chief advantages of gravel is that it is hard and will not disintregrate as rapidly as the softer mediums. Another advantage is that the smooth surface of the stones seems to allow the inert material to be washed away, thus giving considerable unloading and very little trouble from clogging. Hard-clinker cinders offer a good medium if this material is available. The surface of this material is very rough, however, and seems to hold the inert substances, giving much trouble from pooling and clogging. Sand produces good effluents, but clogs easily and cannot be recommended except in cases where the material is abundant locally. Brush does not develop enough bacterial flora to give appreciable results. This is mainly due to the drying out of the loosely packed material during the night when the filter is not in operation.

Rates of Application—The maximum rate of application for sand is 0.15 m.g.d. and for gravel or cinders 1 m.g.d. per acre. The rates depend somewhat upon the strength of the waste applied, as will be shown later. Very low rates and extremely high rates should be avoided, as the first tends to fill the filter with decomposing material and the latter drowns out the bacterial growth.

Strength of Waste—The maximum b.o.d. value for the waste applied to a sand filter operated at the 0.15-m.g.d. rate is about 1,500 p.p.m. With gravel or cinders operated at 1 m.g.d. its maximum is about 1,700 p.p.m. b.o.d. If a higher rate is used the strength of the waste should be reduced accordingly. The rate given, however, is about the maximum for efficient operation. Too strong a waste, even with the rate reduced, should be avoided, as there is a tendency for the material to sour and decompose before it has been oxidized. This condition destroys the oxidizing bacteria and spoils the filter. A fairly high rate of application with a waste lower in oxygen-demanding materials will give much better results than a low rate with a strong waste.

Depth of Filter—The depth of the filter depends largely upon the character of the effluent desired. For sand 30 in. is ample. Gravel and cinders require a much greater depth. Fig. 1 shows the effect of depth upon the b.o.d. of the wastes of varying strength. With wastes up to 1,000 p.p.m. b.o.d., 70 per cent of the unstable material is removed in the first 2 ft.; 6 ft. is about the maximum economical depth for waste of this strength. With wastes from 1,000 to 1,700 p.p.m. b.o.d. an additional 2 ft. could be economically used, although again the largest part of the oxidation takes place in the upper 4 ft. The cinder filter requires about the same depth as does the gravel.

Character of the Effluents—With wastes up to 1,700 p.p.m. b.o.d., most of the sugars or acid-producing compounds are oxidized in the first 4 to 6 ft. of filter. The effluents from the 8-ft. filter operated at the maximum rate and strength of waste are non-souring, slightly turbid and with only about 12 to 15 per cent of the original oxygen-demanding substances remaining. The nitrite and nitrate content of these effluents is shown by Fig. 2. At the 8-ft. depth the nitrites have reached their maximum and start to decline, while the nitrates continue to increase rapidly. It is questionable, however, if the additional nitrate content would compensate for the cost of a deeper filter.

Storage Tank—The design of the filter and other units necessary for full-scale operation is largely influenced by local conditions, as is also the type of medium selected. In any case, however, it will be necessary to provide a storage tank with about three- to four-hour detention to smooth out the peaks in the volume and strength of the waste discharged from the milk plant. Provision should be made for draining and cleaning this tank and for dilution of the waste if necessary. This dilution can be accomplished in many cases by diverting a portion of the condenser water into the waste to be treated. Where a vacuum pan is not in operation, direct dilution may be necessary if the strength of the waste is above the maximum recommended for effective filtration.

There are many factors to be taken into consideration before a decision can be reached as to the most effective and economical method of treatment for the individual milk plant. In general, however, primary biological filtration is capable of quite a wide application, much more so than any other process attempted or observed by this station. There is every reason to believe that this method can be made sufficiently effective to fill the needs of almost any local condition, and that the design can be modified so as to be applicable to most milk-products plants.

Water Studies on Rio Grande and Lower Colorado

Plans for water studies by the International Water Commission of the United States and Mexico, dealing with problems of the Rio Grande and the lower Colorado, are outlined by Secretary of State Stimson in a message to Congress under date of Jan. 8, based on a report by L. M. Lawson, special commissioner. An appropriation of $287,000 is requested to cover the American share of the work for 1½ years.

On the lower Rio Grande there is a half million acres now under irrigation which, together with several towns, is subject to overflow during floods. Remedial measures are rendered difficult by the international character of the problem. It is therefore proposed to make studies of existing works, as well as surveys of available dam and reservoir sites to impound floodwater and develop power. Stream-gaging stations are to be established for determining the contribution to river flow made by tributaries in the United States. Measurements of evaporation, consumptive use of water and irrigation water duty are also contemplated.

Conditions in the Colorado River delta require a geological survey of the delta with a view to determining fault zones and their relation to channel location; preparation of an aero-photographic map of the entire delta, about 1,500 square miles, to plan channel rectification and other flood-protection measures; studies of possible flood control on the Lower Gila River; gaging on Bill Williams Creek to determine its flood crests; studies of maximum flood volume to be expected in the Colorado after the completion of Hoover Dam; and a study of probable changes at the Laguna Dam.

Sloping Cutoff Wall Is Economic Feature of Rolled Earth Dam

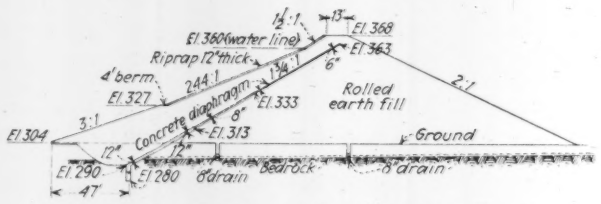
A SLOPING concrete cutoff wall, built in a rolled earth dam to reduce the cost of formwork required by a vertical wall, is the unusual feature in a structure recently completed on the Stanford University campus, Palo Alto, Calif. The dam was built to increase the water supply for irrigation used on the campus. Construction of the fill followed usual practice, particular care being taken in spreading and rolling the material in 4-in. layers. Earth was obtained from borrowpits near the dam site. The maximum height of the dam is about 70 ft., and 110,000 cu.yd. of fill was required.

The relatively low clay content in the borrowpit material made necessary a concrete wall the full height of the dam to insure imperviousness. The wall was placed inside the fill to eliminate the effect of temperature changes, which often damaged an exposed facing slab, and to overcome some of the construction difficulties of building a vertical cutoff. In addition to eliminating the formwork required by the latter type of diaphragm, it was considered possible to secure better rolling close to the wall without endangering it—a critical point in rolled dam construction. Economic advantages resulting from constructing the wall on a slope, including the thinner section, are reported to have more than offset the expense of a greater area of wall.

The slope of $1\frac{3}{4}$ to 1 selected for the cutoff was the result of a compromise between the difficulty of pouring concrete on a flat slope and the desire to eliminate top forms. The upstream slope of the fill and the slope selected for the cutoff located the junction of the wall with streambed about 47 ft. back from the upstream toe. At this point a trench was excavated 16 ft. deep, extending 6 to 8 ft. into bedrock to provide a vertical cutoff wall below the fill. To improve imperviousness most of the material in the streambed above the cutoff trench was excavated to bedrock.

The fill was built up in 10-ft. vertical lifts, maintaining the fill behind the cutoff one lift higher. After each 10-ft. lift was completed the upstream slope of the downstream fill was struck off for a depth of about 1 ft. on a $1\frac{3}{4}$ to 1 slope to insure a firm backing, and the slab was poured against this fill. The slab varied in thickness from 12 in. at the bottom to 6 in. at the top and was reinforced with §-in. square bars 24 in. c. to c. in both directions.

A portable concrete-mixing plant was run out on the fill, and the concrete was poured down the slope into side forms. The length of the lift of slab along the slope was approximately 20 ft., and the work progressed across the face, pouring 20-ft. panels with 5-ft. spaces. After allowing three or four days to permit shrinkage, the 5-ft. openings were poured to complete the lift. Reinforcing rods were spliced in the 5-ft. open sections to permit



Maximum section showing location of cutoff wall

any setting shrinkage to take place without introducing tension in the steel. Water-curing the slab during the period before it was covered presented a problem because of the effect of accumulated water on the upstream fill. The bituminous-coating process was used to overcome this difficulty.

After the 10-ft. lift of the cutoff wall had been completed the fill was raised 10 ft. on both sides. The 10-ft. lift on the upstream side covered the slab just poured, and the fill on the downstream side provided the backing for the next lift of slab. Reinforcing rods were not continued between each successive lift, but the concrete was poured directly against the upper edge of the previous pour.

The upstream slope was paved with riprap about 1 ft. thick. The outlet works consisted of a reinforced-concrete tower at the upstream toe with regulating valves; the discharge passes through a cast-iron outlet pipe incased in concrete under the dam. The spillway is located at another point. Work was carried on both night and day to permit impounding the 1929-1930 runoff.

The design and construction of the dam were carried out under the personal supervision of F. C. Herrmann, consulting engineer, San Francisco. J. G. Rawhauser was the resident engineer. H. C. Vensano & Company were the contractors.

Pouring slab on 10-ft. vertical lift

Spaces between 20-ft. panels are poured after several days to allow for setting. Note 10-ft. difference in the two sections of fill.

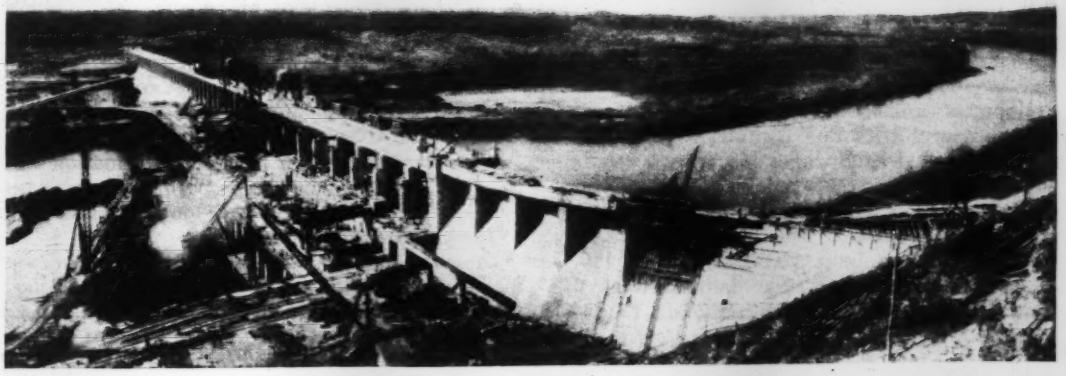


Fig. 1—Osage Dam nearing completion

Construction Features of Osage Hydro-Electric Development

By A. W. CLARK
Works Manager, Stone & Webster Engineering Corporation

Cellular-type cofferdam used in building the power house section of a 2,500-ft. concrete dam near Bagnell, Mo.—Gates closed 18½ months after start of work—Reservoir 129 miles long

NEAR BAGNELL, MO., in the foothills of the Ozark Mountains on the Osage River, there is nearing completion the 129,000-kw. Osage hydro-electric project, forming another link in the chain of power stations owned and operated by the Union Electric Light and Power Co., of St. Louis.

Many interesting construction features are involved in the project, which is located approximately 136 miles (air line) southwest of St. Louis. A cellular-type cofferdam built of steel sheetpiling was used for the headworks and power station portion of the dam that extends about 2,550 ft. across the flat alluvial valley. The placing of 551,000 cu.yd. of concrete, mostly by traveling gantries with tower hoists and chutes; the building of three high-tension transmission circuits, one to St. Louis, and two to the lead mine district of Rivermines, Mo.; the clearing of 30,000 acres of timber for the reservoir and other interesting construction items were part of this undertaking. The principal quantities and dimensions of the project are given in an accompanying table.

Construction work was started Aug. 6, 1929. The first concrete was poured on April 21, 1930, and less than a year later the highway over the dam was completed with the exception of the laying of the wearing surface of the roadway. On Feb. 19, 1931, eighteen and one-half months after the start of construction, the temporary sluice gates in the dam were closed, and the impounding

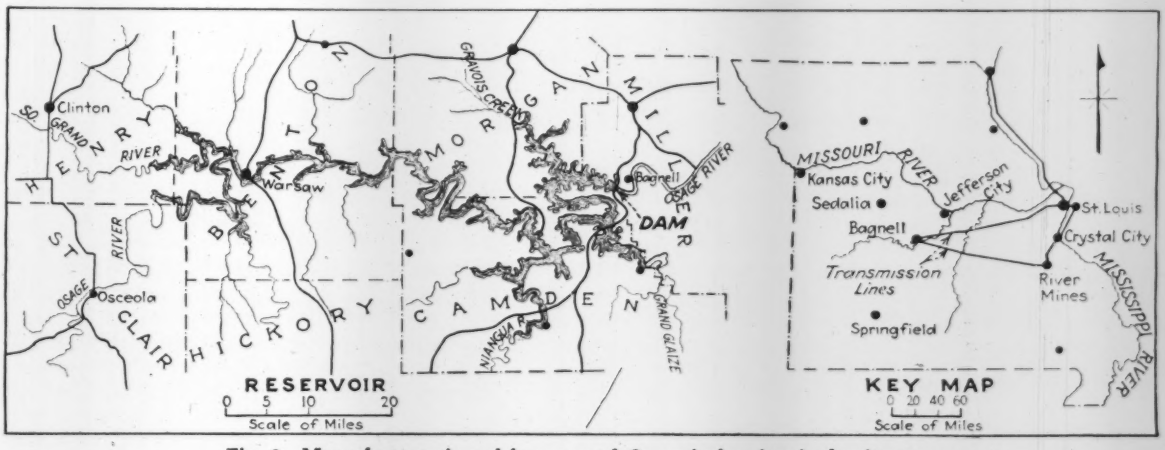


Fig. 2—Map of reservoir and key map of Osage hydro-electric development

of water in the large reservoir began. It is expected that the power plant will produce power in July of this year. A key map and map of the reservoir are shown in Fig. 2.

General Description

The development consists of a masonry dam and power station, integral with and forming a part of the dam, having a combined length of 2,543 ft. and a maximum height above bedrock of 148 ft. The dam proper consists of non-overflow sections totaling 1,512 ft. in length and a spillway section 520 ft. long. The spillway is surmounted by twelve tainter gates, 22 ft. high by 34 ft. wide. A 511-ft. section of the dam contains the power station. A highway bridge with a 20-ft. roadway and a 3-ft. sidewalk runs over the entire length of the dam, carrying a state highway and replacing a ferry crossing now operating about 4 miles downstream. Fig. 3 shows a general plan and typical sections of the dam.

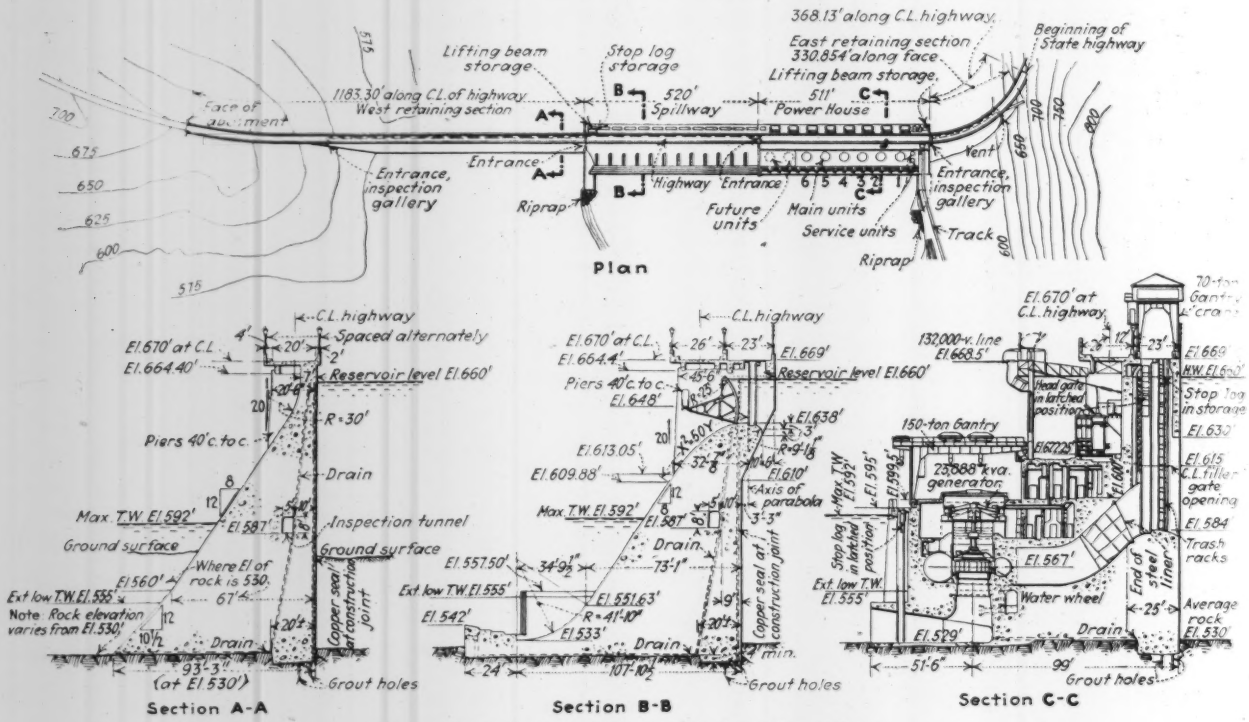


Fig. 3—General plan and typical sections, Osage Dam

Location of cellular cofferdam shown on general plan. East bank is on the right in general plan.

The initial power installation consists of six units of 33,500 hp. each, operating under a 90-ft. head and direct connected to 21,500-kw. generating units, and two 2,100-kw. generating units for station service use. Provision is made for the installation of two additional main units, which will bring the ultimate capacity of the station to about 172,000 kw. A feature of the power house is the absence of a superstructure. Each of the generating units is protected by a metal hood.

Because of the flat slope of the Osage River the dam will create a reservoir 129 miles long, having a surface area of 95 square miles. The total water impounded will be 2,000,000 acre-ft.

Site of Dam—The site of the dam is in a broad alluvial valley, the level portion of which is about 1,700 ft. wide between two lines of rocky hills. The normal river channel, 400 or 500 ft. wide, lies against the east rim of the valley. The bedrock upon which the structures are founded was covered in the valley bottom with about 25 ft. of chert gravel forming the riverbed, and about 25 ft. of alluvial material superimposed on the gravel on the flood plain to the west of the river.

The foundation at the dam site consists of Gasconade dolomite overlying a comparatively shallow layer of Gunter sandstone with an average thickness of about 8 ft., under which there is a deep formation of Proctor dolomite. Across the center part of the riverbed, about 1,000 ft. wide, the Gasconade dolomite has been eroded to the Gunter sandstone.

Construction Railroad—First construction operations included the building of a railroad 4½ miles long between the dam site and Bagnell (where a connection was made with a branch line of the Missouri Pacific Railroad), the laying of numerous yard tracks, the building of a power plant for construction power, the erection of a sand and gravel plant and the construction of camp facilities.

The railroad was built on private right-of-way 60 ft. wide at an elevation which would insure continuous operation with 90,000 sec.-ft. flowing in the river. In addition to the construction of 14 miles of main and yard tracks, a twelve-span bridge on pile piers was built across the river below the dam to give access to the west side. A general storage and classification yard was built along the line of the railroad, where a sufficient area of high ground was available above the flood levels of the Osage River to permit the storage of construction materials and equipment and also permanent equipment for the power station. A landing field was built near this general storage yard to accommodate the power company's plane, which makes scheduled trips between St. Louis and the dam.

The construction railroad is equipped with three 40-ton and two 50-ton steam locomotives, six 8-ton gasoline

QUANTITIES, OSAGE DEVELOPMENT

Length of dam, ft.	2,543
Max. height of dam, ft.	148
Head, ft.	90
Area of reservoir, square miles	95
Length of reservoir, miles	129
Shore line, miles	1,300
Water impounded, acre-ft.	2,000,000
Units (six), hp. of each	33,500
Earth excavated, cu.yd.	847,500
Rock excavated, cu.yd.	73,250
Steel sheetpiling, tons	7,150
Concrete, cu.yd.	551,000

locomotives, two 20-ton gasoline locomotives, 32 standard flat cars, 30 12-cu.yd. dump cars, sixteen 8-ton flat cars, four gondola cars and four locomotive cranes. Forty-two ballast cars were put in service to transport concrete aggregates from the gravel plant to the concrete plant.

The first car of foreign freight was handled over the construction railroad on Aug. 22, 1929, sixteen days after work on the construction railroad was started. From that time until Feb. 1, 1931, 55,580 cars of materials were handled by the railroad, including about 9,000 foreign cars, the rest being sand and gravel or other material originating on the construction railroad.

For construction power purposes two 3,000-kw. steam-turbine units were installed on the site, one of these units serving as a spare. Three 471-hp. boilers, supplying the steam-generating plant, were oil burning. Fuel oil was delivered to the plant in tank cars, from which it was pumped into a 12,000-gal. oil service tank or into a 3,000-bbl. storage tank.

A heating plant, consisting of two 100-hp. boilers, was installed at the concrete plant for the purpose of heating concrete and aggregates during cold weather.

Air compressors, water pumps and water filtration plants for the main camp are located in or adjacent to this temporary power station, so that the operation and maintenance of these services is handled by the power station operators. Water for domestic purposes is pumped from the river, passed through a filter plant and pumped to a 50,000-gal. elevated steel tank located on a hill approximately 300 ft. above the river. This system has a capacity of about 300,000 gal. per day.

Camp—Living quarters for the men employed on the work were established in a camp built on the bluff on the east bank of the river. Thirty-two bunk houses, having a capacity of 28 men each, were erected for laborers. Ten foremen's bunk houses, having individual rooms for each man, were built with a capacity of fourteen men each. The central mess hall had facilities for feeding 960 men, with provision for extension to an ultimate capacity of over 2,000.

Thirty-four three-room and 25 five-room cottages were provided in the main camp, and several dwellings were erected at the gravel plant for foremen and men with families. In addition to the above, the camp included a clubhouse and a cottage for housing the office employees, general foremen and visitors. A school for children was also provided in the camp area. In all, housing facilities were provided for approximately 1,200 men and 73 families.

Cofferdam and River Diversion

The first consideration in the construction program was the excavation of the overlying alluvial material and gravel above the foundation rock. The general program of construction was to cofferdam the spillway and west abutment areas, which are located on the flood plain of the river at the west side of the valley, and to complete the excavation for this part of the work. The west abutment and spillway were then completely concreted except for notches and sluiceways, the bottoms of which were located at the normal river level to provide for later river diversion (Fig. 7).

The excavation for a diversion channel having been carried on simultaneously with the work on the west abutment and spillway portions of the dam, the river was diverted through the temporary notches and sluiceways in the spillway when the concrete in these parts of the structure was completed to a sufficient height. The main power station cofferdam, which extended across the original channel of the river, was then closed and unwatered, and the erection of the permanent power station structure begun (Fig. 4).

Because of the depth and permeable nature of the layer of gravel in the valley bottom a cofferdam with watertight cutoff down to rock was built on the west portion of the dam site and in the river channel. Steel sheetpiling was used for the construction of all cofferdams. Single lines of steel sheeting were driven across the flood plain sufficiently far back from the limits of excavation to insure their support by a prism of earth left between the sheeting line and the foundation area.

In the river channel a self-supporting cellular type of

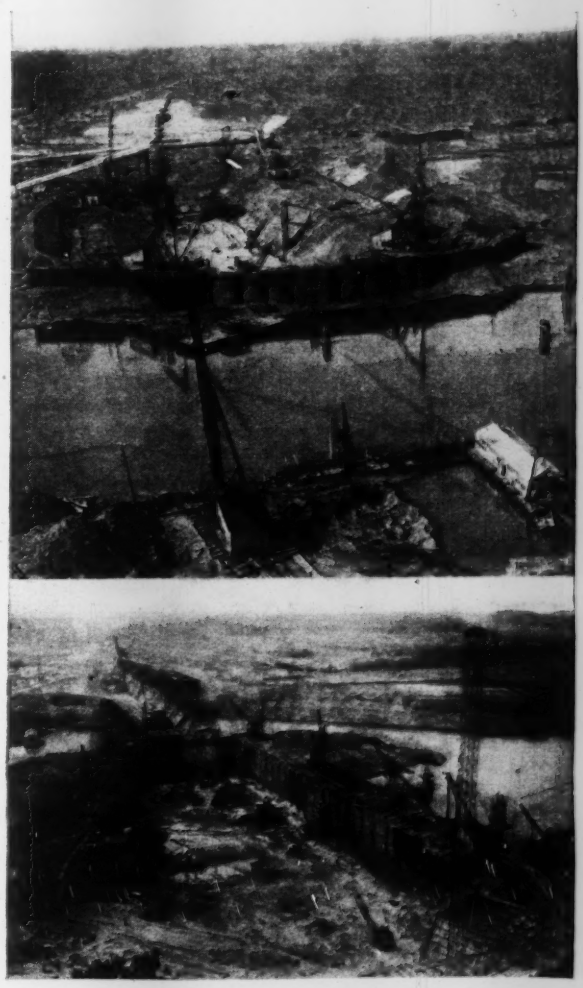


Fig. 4—Osage Dam cofferdams

Above: west or spillway section cofferdam, single-line sheeting except on river side. Below: east or power house cofferdam. Cellular walls built to withstand 60-ft. head.

Fig. 5—Concrete-aggregate handling plant

A, track bins; *B*, belt conveyor to bridge over storage piles; *C*, bridge carrying shuttle conveyor; *D*, reclaiming tunnel; *E*, belt conveyor to mixing plant; *F*, central mixing plant; *G*, cement-handling and storage plant.

construction was used. This cofferdam was designed to withstand an unbalanced water pressure of 60-ft. head on one side. A segmental type of cell was adopted with comparatively short-radius circular arcs for the outer wall and straight line cross-walls common to adjacent cells. For this type of construction any width of structure necessary for stability could be obtained by increasing the length of straight cross-wall, and practically no change in the bursting stress in the circular portion of the cells would result.

Construction of Cofferdams—All the sheetpiling for the cofferdams was driven by six steel skid derricks using 12,000-lb. steam hammers operating in swinging leads. The sheeting was removed by the same rigs using pulling hammers. The driving rigs consisted of modified stiff-leg derricks mounted on steel skids, with the stiff legs brought closer together than the usual 90-deg. spread. This arrangement gave the entire rig sufficient stability to permit being moved without guys; but, when working, two or more guys were attached to the top of the masts to provide sufficient stability for the use of the booms at the sides of the derrick. The derricks were equipped with 110-ft. booms enabling them to set and drive sheeting 60 ft. long.

The straight-line sheeting was set between portable templets. A considerable panel of sheeting was set up and the entire panel driven without attempting to drive any individual pile far ahead of the adjoining piles in the panel. For the cellular cofferdam, wooden templets mounted on guide piling held the sheeting to the proper curvature. After the cells were driven to rock the pile hammer on the skid derrick was replaced by a clamshell bucket and the cell was filled with gravel obtained from the adjacent river bottom. Care was taken in loading the cells to fill them evenly to prevent buckling of the cross-walls.

No spreading, separating or splitting of the interlocks was experienced with the sheeting driven in this manner, and no difficulty was found in redriving the sheeting which was pulled from the straight-line cofferdam for the spillway and west abutment. A total of 8,045 sheets was driven, of which 1,607 were pulled from the spillway and reused in the power house area.

During the first step of the construction program, when the flood plain on the west side of the river was closed by the spillway and west abutment cofferdam, the river channel remaining had sufficient capacity to pass floods of 90,000 sec.-ft. without overtopping the cofferdam. Since greater river flows were possible during the period that this cofferdam would be in use, a sluiceway was installed in the river end of the cofferdam capable of flooding the entire excavated area within 24 hours. This precaution was taken because the slopes of the earth prism which was left to support the steel sheeting could be seriously eroded if this cofferdam were overtopped. In the power station section where the circular cofferdam was used no serious damage was anticipated in the event of the river overtopping the cofferdam, so no sluiceway was provided.

As soon as the critical flood period of the year was passed in May, 1930, work was started on the power station cofferdam, restricting the river channel to a clear width of 200 ft. As soon as the concrete in the west abutment and spillway section had been completed to El. 585, the ordinary high stage of the river, the spillway cofferdam was removed, the diversion channel opened and the river turned through the slots and sluiceways in the spillway section of the dam.

Discharge capacity of the notches and sluiceways was determined by tests on models.

Excavation

Earth excavation was started before the spillway cofferdam was completed and unwatered, but the major portion of the work, except for the diversion channel, was done inside the cofferdam in the dry. Draglines, dredges, clamshells and power shovels were all used in excavating the earth, loose gravel and some sandstone. The largest part of the excavation was done by a 6-yd. and two 3-yd. dragline excavators. The excavated material was loaded into standard-gage dump cars and hauled downstream from the west abutment to build up an area above high-water level for the location of shops and storage yards. Part of the spillway section and east abutment area and most of the diversion channel were excavated by one 15-in. electric dredge and one 10-in. diesel-driven dredge. Inside the power station cofferdam, excavation was accomplished by clamshell or orange-peel buckets operated from the skid derricks located on top of the cofferdam. As far as possible the excavated material was used to fill the cofferdam cells, the excess being loaded on dump cars for filling the station yard area. A 3-yd. dragline was used inside the cofferdam to place material within reach of the clamshells.

The total excavation for the dam, diversion channel, power station and tailrace amounted to 920,000 cu.yd. Included in the total excavated quantity is 73,000 cu.yd. of rock. A total of 343,000 cu.yd. of excavation was removed during February, March and April, 1930. The maximum quantity excavated in one day amounted to 8,115 cu.yd., 2,055 cu.yd. by dredge and 6,060 cu.yd. by the three draglines.

A cutoff trench not less than 4 ft. deep and 20 ft.

wide was excavated along the entire length of the upstream face of the dam and power station. In this cutoff trench two sets of grout holes on 5-ft. centers, staggered, were drilled to depths from 20 to 40 ft. These holes were filled with grout under pressure. Most of the grout holes took only slightly more grout than required to fill the holes. Additional exploratory holes were drilled and grouted wherever unusual conditions were encountered.

Concrete Operations

Concrete for the dam and power station was mixed in a central mixing plant, which, with the material-handling and storage facilities, was designed to place approxi-

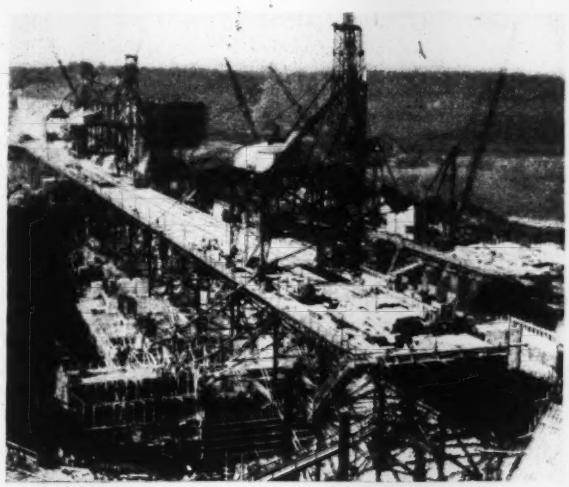


Fig. 6—Gantry cranes on construction bridge

Gantries carry stiff-leg derrick and concrete hoist tower with chutes.

mately 4,000 cu.yd. of concrete per 24 hours. Actually 500,000 cu.yd. was placed from this plant between May 1 and Dec. 1, 1930. In June 113,000 cu.yd. was placed, with 5,082 cu.yd. as the maximum for one 24-hour day.

Cement was delivered to the job in bulk in sealed box cars, the cars being unloaded by power scoopers onto a belt conveyor having a capacity of 213 bbl. per hour. This conveyor discharged into a hopper feeding a screw conveyor, which traveled longitudinally over the top of the storage bin distributing cement over its entire length. The cement bin was 34 ft. wide and 180 ft. long. In cross-section the bin formed an approximate square, with the vertical axis of the bin passing through the corners, thus permitting withdrawal of the entire contents through gates at the bottom. There were 21 of these gates, spaced about 8 ft. apart, which delivered into a traveling hopper that could be fastened to any gate. The hopper was provided with a screw feeder carrying the cement to a belt conveyor for delivery to the top of the mixing plant. Air lines were provided in the bin around the gates to break up any arching action of the cement. The bin had a capacity of 15,000 bbl.

A belt-conveyor system handled the aggregates at the concrete plant (Fig. 5). Aggregates were brought from the gravel plant at Bagnell in 40-ton hopper bottom cars and dumped into track bins. A 24-in. belt 200 ft. long collected the material from the track hopper and delivered it onto a 24-in. inclined belt 440 ft. long leading to a bridge 700 ft. long built of A-frame bents. Operating on top of the bridge was a 24-in. by 330-ft. shuttle conveyor belt which distributed the aggregates into the storage pile. Storage space was provided beneath this bridge for 20,000 cu.yd. of sand and 40,000 cu.yd. of gravel. In the lower part of the A-frame bents was a reclaiming tunnel carrying a 30-in. belt 850 ft. long. From this belt aggregates were transferred to the top of the mixing plant by an inclined conveyor belt 30 in. by 87 ft. A short shuttle belt on top of the mixer bins distributed the material to two gravel and three sand hoppers.

The mixing plant consisted of four 60-cu.ft. mixers with batching equipment housed in a timber structure founded on piles (Fig. 8). This plant was located downstream from the dam and just west of the spillway structure. Storage bins on top of the plant held one hour's supply of material for each of the four mixers based on a three-minute cycle.

All mixers were charged by a weighing batcher. The mixers were located in bins so that two of them dumped simultaneously into floor hoppers on standard flat cars, the car then being moved to a new position to receive charges from the other two mixers. The mixers were locked to insure a full two-minute mixing period after all materials had been introduced into the mixer. In order to pour 5,082 cu.yd. in a single day, it was necessary that all four mixers operate on somewhat less than a 2½-minute cycle continuously during the 24 hours. Mixers delivered 2.2 cu.yd. of concrete per batch.

Concrete Delivery—Each concrete train consisted of four hoppers on a flat car and an 8-ton gasoline locomotive. These trains traveled on a construction bridge parallel with the axis of the dam, the deck of which was 70 ft. below the highest concrete to be placed and 20 ft.

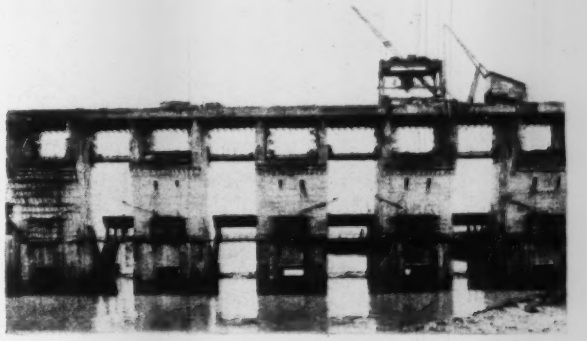


Fig. 7—River diversion through spillway section

above ordinary high water of the river. This bridge was constructed of structural steel with a planked floor. It carried three lines of standard gage railroad tracks on 12-ft. centers and two gantry rails on the outside. Concrete placed below the bridge level was chuted directly into the forms from the concrete trains. Approximately 70,000 cu.yd. of concrete was chuted directly from the mixing plant into place in the foundations of the dam.

Concrete which could not be chuted directly from the bridge was handled by three traveling gantry cranes, shown in Fig. 6, each equipped with a 10-ton derrick and steel concrete hoist tower. Concrete was discharged from the car hoppers into a tower bucket, elevated to an adjustable tower hopper and chuted directly into the forms.

In order to start concreting the east abutment before the construction bridge could be completed across the power house section, concrete was hauled in the trains from the central plant over the railroad bridge below the dam to a 215-ft. tubular rehoist tower erected on the east bank, a distance of 1½ miles from the mixing plant.

It was necessary to make some minor adjustments in the mix for this long haul. Approximately 20,000 cu.yd. was placed by this method.

A field laboratory was located adjacent to the mixing plant, which was equipped with apparatus for testing aggregates, making, storing and crushing test cylinders and running permeability and absorption tests.

Sand and Gravel Plant—Concrete aggregates for the project were largely obtained from a plant constructed for this purpose near the Bagnell end of the construction railroad. Material was dredged from the river by a 15-in. diesel-driven suction dredge. The dredged material was handled to the plant by barges. Four 125-ton and two 250-ton barges were required, which were handled by a 120-hp. diesel stern-wheel towboat.

Material was transferred from the barges to a hopper on shore by means of a 2½-yd. clamshell bucket handled by an electrically operated derrick. From the hopper

Fig. 8—The concrete plant was equipped with four mixers of 60-cu.ft. capacity

the material was delivered to the washing and screening plant by a 30-in. belt conveyor, where it was washed and graded, all material over 3 in. being rejected. As the river run of material was deficient in sand, provision was made for producing additional sand from small gravel by two sets of 24x42-in. sand rolls. In 7½ months this plant produced 164,000 cu.yd. of sand and 404,000 cu.yd. of gravel. The maximum one-day output for the plant was 4,784 cu.yd. In addition to the material produced at this plant, 255,000 cu.yd. of sand and gravel was purchased from outside sources.

Reservoir Site

Coincident with the construction of the dam, work was under way preparing the reservoir basin for flooding. The reservoir has a flooded area of 61,000 acres and a shore line of over 1,300 miles, to most of which access could be had only by the poorest of country roads.

The land required in the reservoir area was obtained by the owner, but the surveys both for land acquisition and to determine water levels, together with other engineering necessary in so vast an area, was done by Stone & Webster Engineering Corporation. The work entailed running over 2,500 miles of traverse to establish shore line and backwater effects. In addition, over 500 surveys were made of individual tracts of land to be condemned or where recording plats were insufficient.

It was necessary to clear the reservoir of trees, dwellings, fences and all other floatable material to the satisfaction of the United States army engineers, representing the Federal Power Commission. This work was carried on by subcontractors under the direction of the engineers, and approximately 30,000 acres of timber was cleared and 900 miles of fences, together with miscellaneous buildings, was removed.

One town of about 450 inhabitants, a county seat, was below reservoir level and was entirely demolished. Work in the reservoir also involved the moving of 32 cemeteries in addition to 74 scattered graves. A total of 2,850 bodies had to be re-interred in new cemeteries located on higher ground.

Power-Line Construction

The three power-distribution circuits built for the project will operate at 132 kv., 3 phase, 60 cycles. A single-circuit line 136 miles long on wood H-frames is being built to the Page Ave. substation in St. Louis on right-of-way which is purchased sufficiently wide to permit the construction of another single-circuit line in the future. A double-circuit line 120 miles long on steel towers is being built to Crystal City and connected at that point to a similar line from Cahokia in East St. Louis. The line to Crystal City was routed by way of Rivermines, a central distribution point for the lead-mining district.

The country traversed by the lines is typical of most of the state south of the Missouri River, sharply rolling and with sparsely disintegrated limestone either at or very close to the surface. While these conditions were advantageous in obtaining long spans, they made the distribution of material and the excavation of foundations rather difficult and were not favorable for obtaining low-resistance ground connections. Numerous creeks and rivers were crossed by the line, and all of them lie in rather confined valleys and have extremely variable flows, requiring careful location of structure in their vicinity.

The distribution of material, excavation for foundations and the erection of structures and cables, although scattered over an immense area, were all on such a large scale that it was an excellent opportunity for the application of power, and the fullest use was made of gasoline-operated tractors, hoists and compressors.

Organization

Louis H. Egan, president, and A. L. Snyder, general manager of the Osage project, have been in executive charge for the Union Electric Light and Power Co. All construction has been under the general direction of A. W. Clark as works manager for the Stone & Webster Engineering Corporation and H. F. Anthony as superintendent for the dam, power house and reservoir work, G. P. Jessup as general superintendent for the dam and power house, O. Davidson as superintendent of the reservoir work, H. C. LaVille as assistant works manager at Bagnell and F. G. Dana as general superintendent of transmission-line construction.

Suez Canal Traffic Declines in 1930

During the first three quarters of 1930 ships of 23,834,000 net tons passed through the Suez Canal, a decrease of 1,027,000 net tons, or 4.1 per cent, as compared with the same period in 1929, and an increase of 230,000 net tons over the 1928 period, according to a report by the U. S. Department of Commerce. The tolls collected during the first three quarters of 1930 amounted to 788,890,000 French francs (one French franc equals $0.0392), against 827,420,000 French francs collected during the comparative period.

A.S.T.M. Regional Meeting at Pittsburgh

Positive methods of weld inspection feature an all-day session of welding papers—23 committee meetings held throughout week with definite results in steel and concrete

Engineering News-Record Staff Report

AT THE second regional meeting of the American Society for Testing Materials, held in Pittsburgh, Pa., March 18, current problems on welding were presented in eleven papers, with special emphasis on inspection and testing. Throughout the week, before and after the welding session, some 23 committees of the society met to discuss and act upon specification changes. About 750 members and guests were registered, a number slightly larger than that at the first regional meeting held in Detroit about a year ago.

At the banquet on March 18 K. G. MacKenzie, president of the society, spoke briefly on the necessity for the society to consider the economic as well as the technical aspects of materials problems. As a beginning he suggested that members who are selling their own products under A.S.T.M. standards with resulting economy and efficiency might make certain that their own purchases are products manufactured and sold under similar specifications. C. L. Warwick, secretary-treasurer, pointed out some of the new fields with which the society is soon to identify itself. New studies are planned on (1) mortars for unit masonry, (2) methods of analysis of industrial water, and (3) paper manufacture. It is also probable that studies will be instituted on (1) soils, (2) heat insulation of materials, (3) steel wire and wire rope, (4) irrigation pipe, (5) leather, (6) foundry molding sands, and (7) oil line pipe.

Committee Meetings

Some important developments were reported in the committee meetings. Committee C-9 on concrete and concrete aggregates reported that as a result of a survey of practice in 56 testing laboratories it had been decided to retain present temperature requirements for storage of concrete and mortar specimens; it had been proposed to raise the required temperature. A report on the operation of pavement core drills was presented and will be published as a part of the committee's annual report. New curing specifications were presented and the recently organized subcommittee on ready-mixed concrete reported work under way on a purchase specification for concretes designed on the basis of (1) arbitrary proportions, (2) water-ratio method and (3) strength.

The committee on steel (A-1) reported final action on several studies that had been carried on during the year. The subcommittee on steel tubing and pipe presented specifications for five different types of pipe—riveted, lock-bar, hammer welded, electric resistance welded and electric fusion welded. These probably will be recommended to the society for approval this summer. The subcommittee on structural steel reported a new specification for steel of 60,000-72,000 lb. per sq.in. ultimate and one for structural rivets of 52,000-62,000 lb. per sq.in. ultimate.

The committee on cast iron created a new subcommittee on culvert pipe under the chairmanship of E. F. Kelly (U. S. Bureau of Public Roads).

Welding was considered from two quite different angles in the sessions on March 18. The papers of the first session were somewhat general in character and were devoted to processes, materials and applications. The second session was devoted to inspection and testing of welding and developed some useful contributions, particularly in the field of non-destructive testing.

Welding Processes and Applications

A useful and original classification of the various welding processes, together with descriptions of their various physical properties and fields of use, was presented by F. T. Llewellyn (U. S. Steel Corp.). Primary division was made into plastic processes (requiring pressure but no additional metal) and fluid or fusion processes (requiring the addition of metal but no pressure). Heat is a basic necessity for all welding methods. In the plastic processes it derives from a forge furnace, an electric furnace or a chemical reaction, as in thermit pressure-welding. In the fusion processes heat is supplied by the gas torch, the electric arc or a reaction from a thermit (iron oxide and aluminum) mixture.

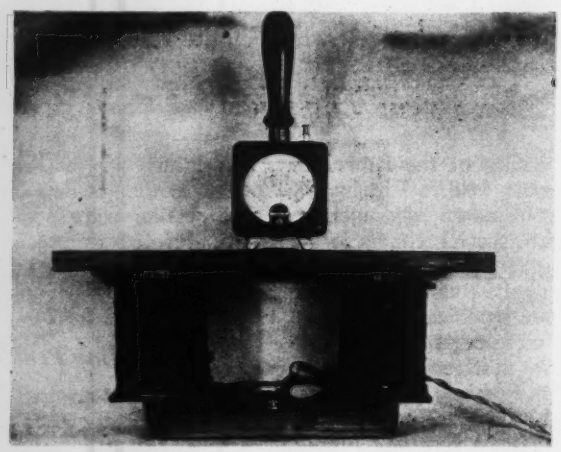
In welding aluminum, said W. M. Dunlap (Aluminum Company of America), torch welding, using oxy-hydrogen or oxyacetylene is the most widely used method, although electric-arc welding is growing in importance with the increased skill of operators and the consequent decrease in porosity of welds. Metallic arc welding is cheaper than other methods. Electric resistance spot welds are replacing rivets in aluminum fabrication and are showing highest efficiency where automatic machines are used with water cooling of the electrodes to prevent alloying of the aluminum with the copper. Aluminum cannot be successfully flash welded.

From data in a paper by C. R. Texter and F. N. Speller (National Tube Co.) on the quality of welding materials it is evident that steels with not more than 0.20 per cent carbon and 0.75 per cent manganese are easily welded. In field welding of line pipe good welds have been obtained in steel with 0.25 to 0.35 per cent carbon and manganese as high as 1.25 per cent. High-carbon steel welding, according to Mr. Texter, should utilize a flux to exclude oxygen and keep the deposited metal in a fluid state until the gases have escaped. Base metal and rod metal should have as nearly the same compositions as possible, if best results are to be obtained. Mr. Speller urged the society to go on record as favoring continuance of current tests by the Metallurgical Advisory Board in Pittsburgh looking to the elimination of non-metallic inclusions, gases and segregations from open-hearth stock.

In discussion J. R. Dawson (Union Carbide & Carbon Research Laboratories) pointed out the necessity for development of higher strength filler materials in view of the trend toward high-strength steel in pipe stock and the possibility of its use for structural shapes. Steel with a carbon content as high as 0.40 per cent can now

be successfully gas welded, according to Mr. Dawson.

In the two other papers in the first session A. M. Candy discussed "Modern Applications of Arc Welding" and E. J. W. Egger (Union Carbide & Carbon Research Laboratories) listed some of the past year's developments in gas welding, including a cheaper and more rapid process involving a new method of blowpipe manipulation and the use of a new welding rod, already used on some 300 miles of high-pressure gas line pipe. Other developments listed by Mr. Egger were high-strength welding rods, liners in gas pipe line joints to insure complete penetration and eliminate "icicles," bronze welding to combat corrosion and the construction of three pipe lines to transport gasoline—Sun Oil Co. from Scranton, Pa., to Philadelphia; Phillips Petroleum Co. from the Texas Panhandle to Kansas City and St. Louis; and Barnsdall Oil Co. from Oklahoma to Chicago, the latter a line some 900 miles long.



New test meter for butt welds

With a magnetic flux from the electro magnet passing through the specimen, dial readings on the meter show ratio of reluctances of weld to parent metal. High ratios indicate faults in weld.

Testing and Inspection

The session on inspection and tests brought out some highly interesting data. Outstanding among these were those presented by Prof. Gilbert E. Doan (Lehigh University) on non-destructive tests of armor plate with radioactive substances. The method is similar to the well-known X-ray method, but with radium substituted for the X-ray tube as the source of energy. Whereas X-rays will penetrate about 3½ in. of steel and form prints on sensitized paper, the shorter gamma rays of radium permit examination of the interior structure of steel 6, 8 or 10 in. thick. In Dr. Doan's work, done in cooperation with Dr. Robert F. Male and Dr. Charles S. Barrett at the Naval Research Laboratory in Washington, a gamma ray print was made through a 12-in. plate. In these investigations the radium used was inclosed in a glass ball about the size of a pea. Special care is necessary in handling radium, but by picking it up with forceps and not remaining in its sphere of influence (6 to 8 ft.) for a very long period of time, there is absolutely no danger, according to Dr. Doan. An additional advantage of weld inspection by radium is that rays are thrown off in all directions. Thus a piece of radium placed inside a pipe or a circular or spherical casting can provide exposures on sensitized paper pasted entirely around the exterior surface. The use of radium is adapted to field inspection methods, whereas X-ray inspection must be done in a laboratory.

Inspecting welds with X-rays at Watertown Arsenal was described by G. F. Jenks. Photographic slides of welds, shown by Colonel Jenks, revealed porosity, slag inclusions, etc., as distinct spots on the sensitized film. Lack of penetration showed in varying shades of gray. Experience is necessary in forming conclusions from X-ray films, since the type and thickness of metal inspected and the distance the rays have to travel must be taken into account. At the arsenal X-ray testing is used in checking the work of new welders and in periodic inspection of work of trained production welders.

Interesting work in the magnetic testing of welds at the Westinghouse laboratory was described by T. R. Watts. Magnetic testing is applicable only to butt welds and is based on the fact that faults in welds increase their reluctance; and thus the difference between good and bad welds may be measured. Two methods are available: (1) using iron filings and (2) by instruments. In both methods a magnetic flux produced by an electric magnet is passed through the steel perpendicular to the welded seam. Iron filings or iron powder sifted on a weld through which a flux is passing will accumulate directly over a line of poor fusion or other serious fault. Instruments are more sensitive to minor defects than iron filing (magnetographic) inspection.

Mr. Watts described several meters recently developed for measuring the magnetic potential drop between two points on a weld. The meters show the ratio of a reading across the weld to a reading on the parent metal. High ratios indicate a bad weld. In using the weld test meters ratios for a good weld to parent metal are determined and checked by testing the weld to destruction. Then if a good weld should have a ratio of 1.2 and the weld under test shows a ratio of 1.5 its "magnetic efficiency" would be 80 per cent.

The use of a physician's stethoscope in examining the quality of welds was described by J. R. Dawson (Union Carbide & Carbon Research Laboratories). By placing a stethoscope to the ears and lightly tapping with a hammer at different points along the weld, faults may be located. This method is particularly adapted to structural steel and pressure vessel work. Mr. Dawson announced that automatic apparatus has recently been developed for recording stethoscopic tests.

Production inspection methods were described by R. Kraus (Westinghouse Electric & Mfg. Co.). These include both inspection of operator's technique and inspection of the finished weld. Proper manipulation of the welding electrode is generally thought to require a special weaving motion, but Westinghouse has adopted the simpler method of laying beads parallel with the length of the welds, followed by cover beads for ⅜-in. fillets or larger. Good results are obtained with this method if the electrode is held vertical to the pool. Visual inspection supplemented by gages and sometimes by iron filings (the magnetographic method) is usual.

In a paper on fatigue and impact testing of welded products, T. M. Jasper (A. O. Smith Corp.) pointed out that fatigue tests, while useful in developing procedures of welding, are too complicated and expensive to be considered as an inspection method. Impact tests, such as those performed with the Charpy and Izod machines, are also more useful as an aid to developing a welding process than in straight inspection work. Generally speaking, welds that will test highest in impact, other qualities being equal, are best.

FROM JOB AND OFFICE

Hints That Cut Cost and Time for the Contractor and Engineer

Tower-Mounted Hoists Lift Bridge Span

By H. W. PITTENGER,
Industrial Engineer, Westinghouse Electric & Mfg. Co., Buffalo, N. Y.

REMOVAL of all machinery from the movable spans of vertical-lift bridges is advantageous in order to reduce the weight to be raised and to simplify electrical connections. Doing this introduces complications, however, because it is necessary to drive the span at each end by means of machinery without any mechanical connection. Variations in motor speeds tend to lift one end of the span faster than the other, resulting in damage to both bridge and machinery and in interruption to service.

Lift span raised by hoists mounted on towers

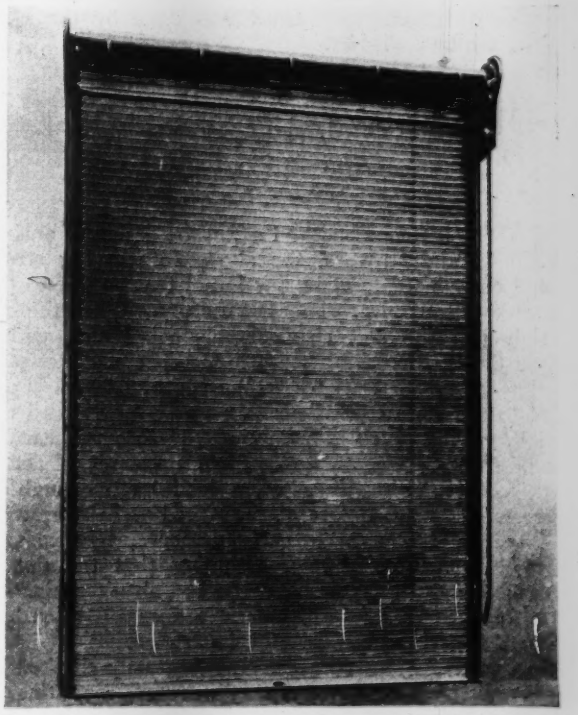
A scheme for overcoming this difficulty has been devised and used on a railroad bridge across the Tombigbee River in Alabama. The movable span of this bridge, as is shown by the illustration, is entirely free of operating machinery. It is lifted by electric motors connected to driving drums in each tower with an unusual electric-control scheme for keeping the span horizontal while in motion. The duplicate motors at each end are operated from the same master controller, which should cause them to operate at nearly the same speed. Such variations as do occur are compensated for by an auxiliary controller with a vertical handle arranged to control two resistance points of one motor if the handle is thrown in one direction, and two resistance points on the other motor if thrown in the opposite direction. Directly over this auxiliary controller is mounted a synchronoscope so connected to the operating machinery at each end that it indicates any variation of the span from the true horizontal. When a tilt occurs the synchronoscope pointer will swing, and the operator must then move the handle of the auxiliary controller to conform with the pointer swing. This slows down the faster motor and brings the bridge back to a true level.

To guard against carelessness an additional safeguard is provided in the form of two skew limit switches, one geared to and driven by each set of operating machinery. These switches cut off the current before the bridge becomes dangerously out of level, at the same time setting the brakes. In order to proceed, the operator must bypass the skew limit switch circuit and level the span.

Besides the bridge already named, this plan of control has also been installed on two other railroad bridges in the South, while other projects are under consideration.

Aluminum Alloy Doors Used in Railroad Roundhouse

THE roundhouse of the Norfolk & Western Railroad at Williamson, W. Va., is equipped with 23 curtain-type doors made from the light strong alloys of aluminum. These doors, which are 13 ft. wide and 19 ft. 11 in. high, weigh 323 lb. each. The slats are fabricated from 19-gage sheets and the bottom bars from extruded angles. Aluminum rivets are employed in their assembly. The doors were assembled by the J. G. Wilson Corp., Norfolk, Va. Each one is operated by means of a hand chain which actuates the roller shaft through a train of spur gears with a ratio of 6.8 to 1. Had galvanized steel been used, the weight of each door would have been increased to 1,080 lb. This increase in weight would have necessitated the use of a gear ratio



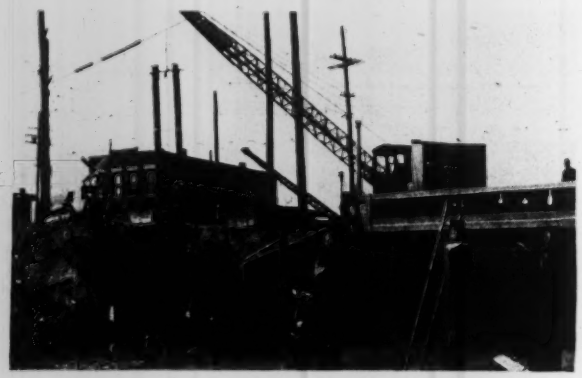
Curtain door built of aluminum

of 21 to 1, which would have materially decreased the speed with which the doors could be raised or lowered.

The aluminum doors, besides being light in weight and easily operated, offer an additional advantage. Since aluminum is highly resistant to the corrosive action of the sulphur-laden atmosphere, the doors require no painting to protect them from the elements.

Tractor-Mounted Winch Steadies Pile Driven From Hanging Leads

WHILE driving piles for a temporary bridge to be used during the reconstruction of an existing one at East Peoria, Ill., a double-drum tractor-mounted winch was used to hold each pile upright while it was



Driving piles for temporary stream crossing

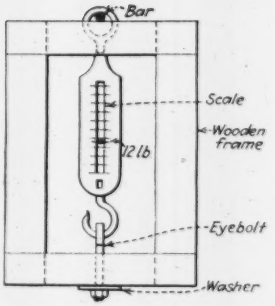
driven by a piledriver and set of hanging leads suspended from a crane boom. The illustration shows how the lines were rigged, one pulling directly on the pile while the other was reeved through a block so as to pull in the opposite direction. The work was done by the East Peoria sanitary district.

Initial Stress on Tightened Bolts

By THOMAS E. HADLEY
Fisher Body Corp., Detroit, Mich.

MANY engineers believe that, in the design of anchor bolts and hangers, the allowable working stress should be reduced to allow for initial tension due to the tightening of the nut. This is a fallacy. When the nut is tightened the bolt shank is elongated and, within elastic limits, the initial stress induced is in direct proportion to this elongation. When additional load is applied to the bolt there is no increase in stress until the initial tension, which is maintained by internal bearing, has been superseded by an equivalent amount of actual load. After, and only after, a load large enough to overcome this initial internal bearing has been applied, will the bolt start to elongate further and hence take more stress. Accordingly, assuming that the nut is tightened to such a point that the bolt-shank elongation is within the elastic limit, there is no need to reduce allowable working stresses for initial tension.

The truth of this statement can be easily checked by means of the simple apparatus illustrated, consisting of a wooden frame, an ordinary spring balance and an eyebolt and nut. The fact that the scale reading varies in



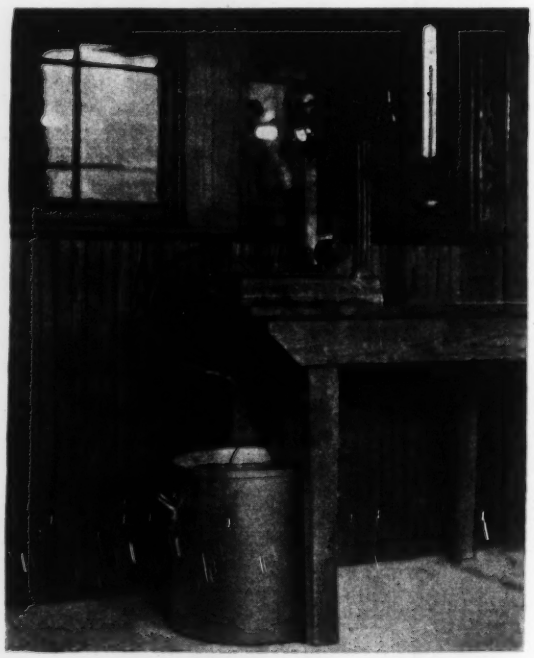
Testing effect of initial stress

accordance with Hooke's law gives a magnified elongation reading, which gives a correct indication of the tendency of the bolt to take stress. With the equipment assembled as shown, the nut is tightened to any desired point; for example, until the scale reads 12 lb., representing the initial stress. Now, if a 10-lb. weight is hung from the bolt, the scale will continue to read 12 lb., showing that no elongation has taken place, and, therefore, that no additional stress has been taken by the bolt shank. If an 18-lb. weight is used, however, the scale will read 18 lb., showing that, regardless of the initial 12-lb. tension, the final stress is dependent only upon the final superimposed load when the latter is large enough to overcome the initial stress. In practice, if 18,000 lb. per square inch is the allowable stress in a bolt, and these loads are thought of as 12,000 and 18,000 lb. per square inch, instead of 12 and 18 lb., it will readily be seen that the working stress need not be reduced to allow for the initial stress.

Apparent Specific Gravity Apparatus

By AUSTIN F. SHURE
Engineer of Surveys, State Roads Commission, Baltimore, Md.

THE apparatus illustrated is a simple and cheap device for determining the apparent specific gravity of stone, slag or gravel. It consists of a small platform scale, graduated in pounds and ounces and weighing up



Specific gravity device

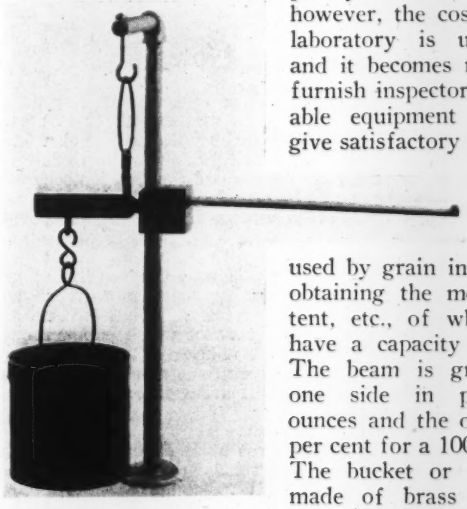
to 200 lb.; a water can, a wire basket and a hanger.

The metal can or water container is about 18 in. high and 16 in. in diameter. The basket or materials container is about 11 in. high and 10 in. in diameter. It is made of ¼-in. mesh galvanized wire screen and lined with No. 14 mesh bronze screen cloth. The metal hanger or gooseneck is used to suspend the materials container in the can of water from the platform scale. The first operation is to obtain the following weights: (*a*) empty basket, (*b*) basket filled with dry sample, (*c*) filled basket immersed in water and (*d*) empty basket immersed in water. Next by applying these values to the formula $\frac{b - a}{(b - a) - (c - d)}$, a figure is obtained which is the apparent specific gravity of the material.

Scales for Field Tests of Materials

By HAROLD ALLEN
Engineer of Materials, Kansas Highway Commission, Topeka, Kan.

CONTROL of materials in road construction is usually effected by field tests. On large costly jobs it is practical to set up a field laboratory and equip it completely. On smaller jobs, however, the cost of such a laboratory is unwarranted, and it becomes necessary to furnish inspectors with portable equipment which will give satisfactory service. The scales are patterned after those used by grain inspectors for obtaining the moisture content, etc., of wheat. They have a capacity of 12.5 lb. The beam is graduated on one side in pounds and ounces and the other side in per cent for a 100-oz. sample. The bucket or container is made of brass and has a capacity of 0.1 cu.ft. It is machined accurately and conforms with the A.S.T.M. requirements for a measure for use in determining the weight per cubic foot of a fine aggregate for concrete.



Materials tests scale

The accompanying view shows the scales and a stand for supporting them. The stand is not necessary, however, since the scales may be hung on a wire supported by a rafter in any small building to be found around a materials plant or construction job, or from any other support that may be handy.

These scales have been found accurate and very durable. They are used in making sieve analyses of aggregates, in determining the weight per cubic foot and moisture content of aggregates and in making sieve analyses and wash tests of surfacing materials.

Collapsible Construction Trestle Across Navigable Channel

By L. C. TORELL
Field Engineer, Fegles Construction Co., Ltd., Minneapolis, Minn.

A TRESTLE which folds down and lies on the bottom when boats need to pass is being successfully operated in building the navigation lock and dam on the Mississippi River at Hastings, Minn., about 22 miles below St. Paul. The structures consist of a 110x500-ft. lock on the west bank, a 100-ft. section of Boule dam, a section of twenty 30-ft. tainter gates and 3,250 ft. of earth embankment. The specifications required the lock to be built first and then the Boule dam to provide an emergency channel for navigation.

Topographical conditions required the location of the contractor's plant on the lock side of the river, which made necessary a crossing of both the lock and the Boule dam openings to get to the remainder of the work. This crossing had to be so constructed that either channel or both could be opened for navigation. A cableway was discarded because of the great height required to clear the boats, and drawbridges cost more than the work could afford. The decision settled on the folding-trestle structure shown by the accompanying sketch. This trestle structure has been operated readily in a 5-mile current.

The structure is simple. Steel bents of H-posts, angle-bracing and H-caps carry timber stringers; the posts of the bent are hinged at the bottom, and each span of stringers is hinged at the top. The drawing shows the method of lowering and raising the trestle bents. The stringers are designed with just enough buoyancy to balance the weight of the steel when the trestle is submerged. The design of the trestle was worked out by the Fegles Construction Co., general contractor for the Hastings lock and dam.

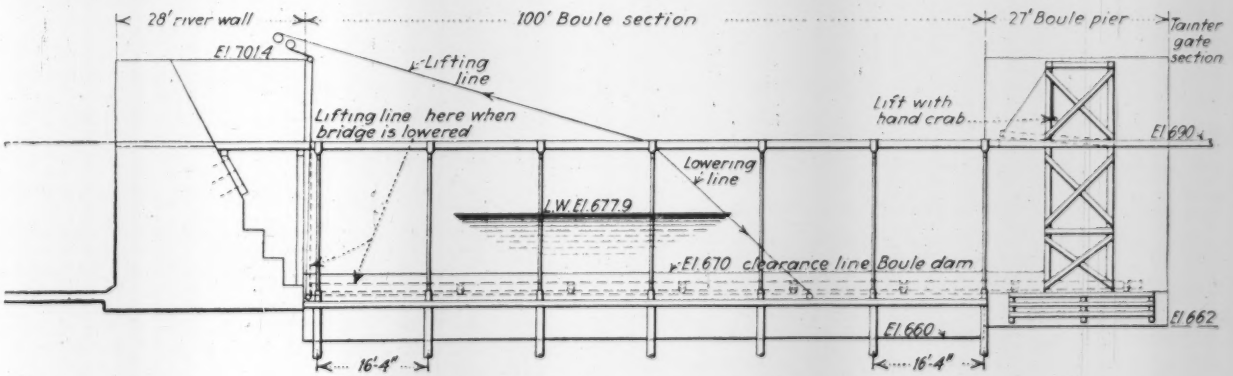


Diagram elevation showing operation of folding trestle

A Non-Sparking Concrete Floor Surface

ONE of the safety requirements laid down for the powder magazines constructed at the new naval ammunition depot, Hawthorne, Nev., was that the concrete floors should have non-sparking surfaces. The importance of this requirement is apparent from the fact that 71 tons of high explosives are stored in each magazine unit and the ultimate total for the depot as a whole is about 6,000 tons. The non-sparking requirement was met by treating the thoroughly cleaned concrete floor surface with a solution of 3 lb. of castile soap completely dissolved in 4 gal. of water. This solution was applied liberally to the surface at a temperature not less than 200 deg. F. and worked into the surface with a long-handled brush in a manner to remove air bubbles, without forming a lather. After thorough drying, the floor was treated with a solution of ½ lb. of potassium alum dissolved in 4 gal. of lukewarm water. When this application had dried, another complete treatment of soap and water, followed by alum and water, was repeated. After drying again, the floor was finally washed to remove the light coating of potash which formed on the surface. On floors treated in this way it was practically impossible to draw sparks by striking the concrete surface with hard objects.

A general article on the planning and construction of the Hawthorne ammunition depot appeared in *Engineering News-Record*, Nov. 20, 1930, p. 803.

Highway Bridge Span Floated Over Open Draw in Holland

By L. PLEYSIER

Steel Erection Superintendent, New York City

AN UNUSUALLY difficult engineering operation was recently carried out successfully in Holland when a 293-ft. bridge span weighing 930 tons was floated a distance of 19 miles from the point of erection, a steel fabrication plant, to the final site of the structure. The most difficult part of this undertaking was the passage of the two large barges carrying the span through the two channels adjacent to a single-track railway swing bridge of the deck type, the new span passing over the railway structure with a clearance of 4 ft. vertically and only 8 in. at each side horizontally.

The 930-ton span which was moved was the first unit in a new bridge over the Bergsche Maas, near Keizersveer, Holland. This structure will form an important link in the international highway from Amsterdam, Holland, to Utrecht, Belgium, and will replace a ferry which has been in use for more than 200 years. The span has a length of more than 293 ft., a 28-ft. roadway and two 7-ft. sidewalks. It was supported throughout the 19-mile trip by two heavy barges, each of which carried three double A-shaped towers connected by suitable bracing. Four tugboats maneuvered the two barges to the site of the railway bridge, where an overnight stop was made. At high tide, which occurred at dawn, the bracing between barges was removed in order to clear the drawbridge, and the passage was successfully made in seven minutes, despite difficulties induced by a severe hailstorm. Signals to the tugboats were transmitted by red and green lights flashed from the floating span.

The new bridge was designed and is being erected under the supervision of the government bridge bureau,

930-ton highway bridge span transported by two barges

which has been formed to supervise an extensive bridge program now being carried out in Holland. W. J. H. Harmsen is chief engineer of the bureau, and R. H. Groeneveld is resident engineer on the new structure. The erection scheme used was devised by R. M. de Vries, engineer for Penn & Bauduin, the steel erectors. The work of floating the new span into position was done by De Wit's Wrecking and Salvage Association, Rotterdam.

[Since this article was written, word has been received that the second span of this bridge was successfully floated into place on March 9. No changes were made in the method of procedure.—EDITOR.]

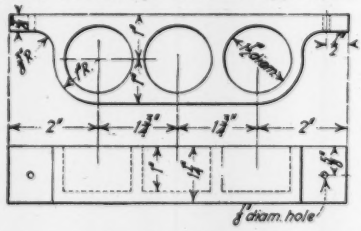
Job and Office Notes

WHEN ATTEMPTING to sight a tack or other object very close to the transit, it is usually impossible to focus the instrument clearly. This condition can be remedied by placing a pocket lens in front of the telescope eyepiece. It is, however, impossible to see the cross-hairs and the tack at the same time, so for accurate lining a scratch or mark should be placed on the rim of the front lens. These two expedients make possible accurate sights at very close ranges.—GEORGE GOODWIN, Glace Bay, Nova Scotia.

INJECTION of odor-producing liquids into the ventilating air lines of mines as an emergency warning signal to workers has been approved by the American Standards Association. Any of a number of chemicals can be used, none of which is dangerous, even if inhaled for a long period. A relatively small amount of liquid is necessary. Distribution is extremely rapid as the air in most mines moves at velocities of from several hundred to several thousand feet per minute.

POLE ROOFS formed by a single cut at angle of 15 deg. have many advantages over the conventional peak formed by two cuts, according to the International Creosoting & Construction Co., Galveston, Tex. Poles cut with the ridge type of roof have a minimum of wood at the center, the natural cleavage point, which invites checking. The one-way roof does not have this disadvantage. Furthermore, it provides better drainage for the depressions formed between the summerwood rings by weathering. Also, as there is less surface on a one-way than on a two-way roof, evaporation of the preservative is lessened. The new roof has been adopted as a standard by the Bell System, the Electric Bond & Share Co., and other utility companies.

MOST DRAFTSMEN have at some time or other experienced the thrill of upsetting a bottle of ink on the drawing board, an accident which always seem to happen just about the time a tracing is nearly completed. This means tedious erasing and a loss of time and money. If the accident is a serious one, it may mean an entire new tracing. The danger can be eliminated by keeping bottles of ink in a stand fastened to the side of the drawing table, away from the tracing. A block of wood, drilled out to take three standard ink bottles (see sketch), is fastened to the table with wood screws.—HERBERT STERLING, *Philadelphia, Pa.*



LETTERS TO THE EDITOR

A Forum for Expression of Views by Engineers and Contractors

✦

The London Building Act of 1930

Sir—I read with interest Robins Fleming's letter in your issue Nov. 27, 1930. Mr. Fleming points out that there is very little difference between the present act and its predecessors. Before the 1930 act came into operation there were a number of smaller acts, all dealing with building work in London. These were, briefly, the 1894 act (commonly known as the principal act), which dealt with building line, formation of streets and, among other things, with the general requirements for brick construction; the 1905 amendment act, which dealt mainly with fire-preventive construction; the 1908 general powers act, dealing with cubical extent and the uniting of buildings; the 1909 general powers act, which dealt with steel-framed construction; and a few less important acts.

It was evident that the building regulations were somewhat scattered and that the time had come to consolidate these different enactments. This consolidation has been brought about by the passing of the London building act of 1930. It is believed to be a preliminary step to its entire repeal, so that a new act more in tune with present materials and modes of construction may be facilitated.

The old 1909 general powers act is now under the guise of the third schedule of the 1930 act and deals with steel-frame construction. Therein, it should be noted, the London County Council is empowered to waive certain of the enactments. It is with the aid of this power that structural engineers in London can design more economically than is apparent to those unfamiliar with the workings of the London authorities. Increased working stresses and loads are allowed within certain limits, provided certain definite conditions are complied with. The principal of these is that the steel used must be of quality "A" as defined in the British standard specification for structural steel for bridges and general building construction, No. 15—1930. This steel must be made by the open-hearth process (acid or basic) and must not contain more than 0.06 per cent of sulphur or phosphorus. There are objections to this procedure, as it entails delay and uncertainty, since the Council's consent must be applied for in each case, and this may or may not be granted.

There is considerable agitation in London at present by interested parties for the speedy repeal of the act and the enactment of one with less conservative structural clauses.

C. RUGGERI,
Graduate, Institution of Structural Engineers.

London, England,
Jan. 27, 1931.

Sheetpiling in Corpus Christi Dam

Sir—I am not trying to add another diagnosis to the cause of failure of the Corpus Christi Dam but would like to emphasize the fact that sheetpiling, either steel or wood, is far from being impervious to seepage.

During the construction of Lake Kemp Dam near Wichita Falls, Tex., interlocking steel sheetpiling was driven across the Big Wichita River; and although driven 40 ft. deep through sand into clay, the difference of head above and below the piling was only 0.2 ft. Thus as a cutoff wall it served only as a screen to check and disperse the flow of the entire river during low stage.

Bligh's "line of creep theory" applies to Indian dams and weirs having impervious aprons and cutoff walls. Experiments on the flow of water through various Indian riverbed sands have been carefully worked out by Colonel Clibborn at Thomason's Civil Engineering College at Rookee, India.

Coleman's experiments on the action of water under dams, conducted at the University of Michigan, clearly showed that piling must be tight to be effective, very small leakage destroying its action.

Sheetpiling does lessen the danger of blowouts and boils and acts as a screen that checks the rapid flow of water and disperses leakage channels over a wide area, thereby limiting the danger of excessive flows carrying sand.

A. K. Pollock's point is well taken regarding sand settlement around round piling; however, in extending the line of creep in sand foundations more reliance should be placed on impervious aprons and talus than on any form of sheetpiling.

H. L. THACKWELL.

Jacksonville, Tex.,
March 10, 1931.

Earth-Dam Core Material

Sir—I have made several attempts to correlate the various bits of data contained in *Engineering News-Record* in the several articles on earth dams that appeared recently.

I find the three following numerical quantities: (1) 62.5 lb. = weight of 1 cu.ft. of water; (2) 62.5 lb. = weight of 100 lb. of core-fill material less its displaced water; (3) 62.5 lb. = $f \times 100$ lb. (weight of 1 cu.ft. of core-fill solid), in which f, the coeff. of friction = 0.625. These quantities are by the data given and derived in those articles identical in fact, the matter of a unit or two in the decimal being inconsequential. Note the various possibilities of the uses of these factors in derivations or analyses of internal stresses.

It is not a sufficiently proved thing that normal hydraulic pressure does not exist within those cores.

No mention is made of the Gatun (Panama) dam, the predecessor of all these with the elaborate and painstaking experiments on its model, with fixed determination of hydraulic gradient within the structure. It should certainly have merited allusion in Mr. Lane's article.

R. R. RYAN.

Newberry, Mich.,
Jan. 3, 1931.

Venturi Meter for Irrigation Service

Sir—Kindly let me call your attention to an error in the article entitled "A Practical Venturi Meter for Irrigation Service," appearing in the Jan. 29 issue. The formula given in the fifteenth line from the bottom of p. 188, in the first column, should read $Q = CM\sqrt{H}$, instead of $Q = CMH$.

J. E. CHRISTIANSEN,
Junior Irrigation Engineer,
College of Agriculture,
University of California.

Davis, Calif.,
Feb. 12, 1931.

First Deep Open-Dredged Caissons

Sir—In your issue of Feb. 12 you carry an article relative to the pier construction on the Mid-Hudson bridge (p. 275), in which I note the following statement: "The Central New England Railway bridge across the Hudson River at Poughkeepsie, N. Y., built in 1888, was the first structure in America to be founded by deep open-dredged caissons."

This statement appears to be in error in that the piers of the Texas & Pacific Railway bridge crossing the Atchafalaya River at Melville, La., were sunk by open dredging in 1882-83. In this connection the following quotation from a letter of Gen. Greenville M. Dodge, addressed to W. H. Abrams, of the Texas & Pacific Railway Co., may be of interest both with respect to the matter of founding by open dredging and as indicating the instability of the Atchafalaya River bed and the powerful action of great floods.

> We were greatly delayed in the construction of this bridge from the fact that in our first sounding we got a foundation, as we supposed, 65 ft. below water level, and started our caissons for that depth; but after putting up one or two of the piers at that depth a flood came down the Atchafalaya and washed out some 40 ft. below our foundation, and that put us in apparently a fix, as we could not go down that far with pneumatic process. But Mr. Anderson, who was a very ingenious man and great in overcoming difficulties, invented what is known as the clam dredge, and he rigged this dredge so as to give it a fall from the grade of the road to the bottom of the pier, which set it in the sand, and by the machinery closed it up like a clamshell, and by weighting the piers we went down in this way 125 ft., according to my recollection. The clam dredge has been used for that kind of work ever since.

So far as I know this was the first example of open dredging for pier foundations.

IRA W. SYLVESTER.

Alexandria, La.,
Feb. 24, 1931.

NEWS OF THE WEEK

Refuse Dumping at Sea by New York Is Scored by Master

SPECIFYING that a suitable time for the construction of disposal plants should first be allowed, the issuance of an injunction forbidding the dumping at sea of refuse and garbage from New York City is recommended in a report submitted to the U. S. Supreme Court on March 20 by Edward K. Campbell, special master appointed by the court to hear evidence in a suit instituted by the State of New Jersey. Appointment of a special master to determine how much time is necessary, a matter not covered by evidence in the present report, is advised. The report also rebukes the city for delaying "unreasonably long" in adopting a proper disposal system.

Evidence submitted to the special master indicated that New York has been dumping refuse at sea since 1918, the quantities increasing from year to year until a total of nearly 500,000 tons was thus disposed of in 1929. Enough of this material is subsequently cast ashore along the coast of New Jersey, in the opinion of the master, to constitute a public nuisance. The region chiefly affected extends 50 miles along the shore from Atlantic Highlands to Beach Haven, including 29 communities with a permanent population of 160,000 and a summer total of many times this number. These municipalities have found it necessary, at frequent intervals, to remove offensive material from their beaches at considerable cost.

New York's defense was based on evidence that ocean disposal is a temporary expedient, that it is carried on under the supervision of the war department, and that, since a number of coast cities and many steamships dump their wastes into the sea, there is no definite proof that the material reaching the beaches originates in New York City. It was also held that the city had been unable to erect sufficient incinerators because it lacked power to condemn sites until the passage of enabling legislation in 1929. The master points out, however, that no definite action has been taken by the city since that date, although a program providing for the building of nineteen incinerators was presented to the mayor by the department of sanitation in 1929.

More and Earlier Road Construction in 1931

Telegraphic reports from 40 of the 48 states indicate the extent of work to be done this year

REPORTS by telegram from 40 states indicate that early contracts are being let for highway construction and that for the whole country road expenditures in 1931 will be greater than in 1930. A number of states are awaiting definite legislation to determine exact expenditures. A few states report large decreases in expenditure which are offset by a large increase in one state and small increases in many of the states. The following are condensed reports from the states heard from:

Arkansas—Contracts to date, $7,000,000; in 1930, $3,000,000. About same total expenditure as 1930. At present eighteen concrete paving units operating.

Arizona—Program double that of 1930.

Colorado — Expenditures 1930, $6,250,000; anticipated 1931, $9,482,000.

Connecticut—Approximately $1,000,000 more than 1930. Work at least two months ahead of 1930.

Delaware — Expenditures 1930, $1,802,000; anticipated 1931, $2,212,000. Contracts to date: 1931, $984,000; 1930, $421,000.

Florida—Will spend estimated state income of about $11,000,000 and loan advanced by federal government.

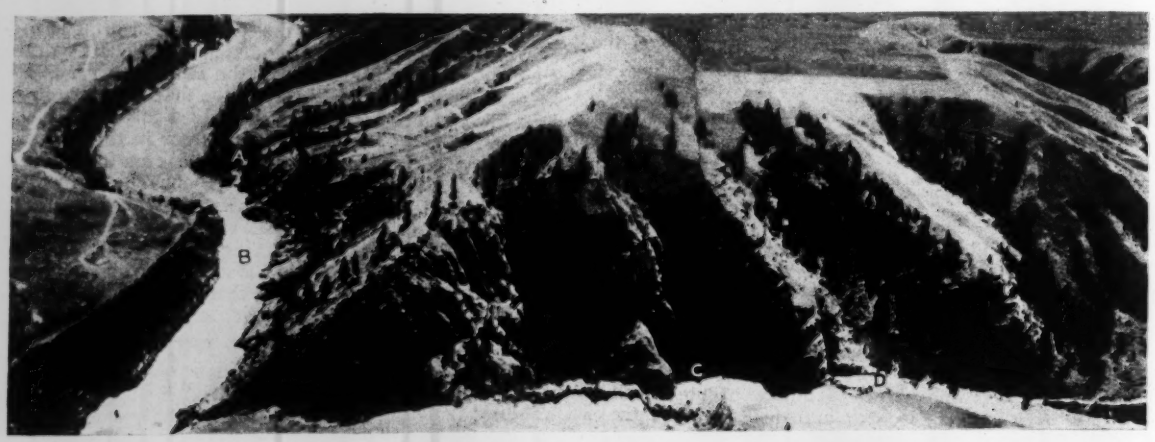
Georgia — Expenditures will exceed 1930 by 25 per cent. Contracts let in February about $4,000,000; in 1930, none before April 1.

Idaho—Expenditures 1930, $5,600,000; anticipated 1931, $6,120,000.

Indiana—Construction program larger than 1930.

Iowa—Expenditures 1930, about $42,000,000; in 1931, about $25,000,000; three-fourths under contract by April 1.

Kentucky — Contracts awarded, $1,400,000; bids received, $1,750,000; bids



FLATHEAD POWER SITE IN MONTANA NOW BEING DEVELOPED

Airplane view of the Flathead River 5 miles below the outlet of Flathead Lake in Montana, where a subsidiary of the Montana Power Co., the Rocky Mountain Power Co., is now working on the diversion of the river through a 1,700-ft. tunnel, intake shown at *A* and outlet at *D*. The project will utilize Flathead Lake as a regulating reservoir by means of a dam at *B*, which will submerge the present lake outlet. The dam will be 200 ft. high and 630 ft. long, including 400 ft. of overflow spillway. Penstock tunnels 870 ft. long through the ridge in the foreground will conduct the water to the power house, to be located at *C*. It is proposed to install three 50,000-hp. units which will operate under a head of 185 ft. when the lake is full. Railroad connections to the dam and power house sites and construction plant and camps have been completed. Work on the diversion tunnel is progressing rapidly and will be completed late in 1931.

advertised for April 15, $1,500,000. Total expenditure will exceed that of 1930.

Missouri—Expenditures 1930, $43,921,000; anticipated 1931, $41,354,000.

Louisiana—Plan to construct 1,500 miles of hard-surface roads and eight bridges costing from $250,000 to $1,500,000. Bids scheduled for April 28, June 21, Aug. 11 and Sept. 15 total about $30,000,000.

Maine—Expenditures 1930, $3,331,106; anticipated 1931, $3,932,138. March and April lettings; earliest ever had, cover all but two projects.

Maryland—Contracts awarded to date amount to $2,600,000; legislature now considering 1931 appropriations.

Massachusetts—Legislature considering budget; contracts amounting to $2,500,000 already awarded.

Minnesota—Programs for 1930 and 1931 as follows:

Year	Miles Paved	Miles Graded	Cost	Other Work
1930	285	440	$12,500,000	$1,000,000
1931	325	600	16,000,000	1,500,000

If $15,000,000 bond issue passes legislature above amounts for 1931 will be materially increased.

Mississippi—Spring contracts 1930, $215,000; 1931, $2,900,000.

Montana—Expenditures of $3,600,000 in 1930 will be doubled in 1931. Contracts to date are $5,500,000, contrasted with $600,000 in 1930.

Nebraska—Expenditure 1931 will exceed that of 1930 by $3,500,000. Total $13,000,000.

New Hampshire—Road budget for 1931 will be slightly less than for 1930. Road lettings begin in April.

New Mexico—Expenditure approximately double 1930.

New Jersey—Expenditures in 1931 approximately $38,000,000.

Nevada—Increase in 1931 of approximately 100 per cent over $4,000,000 program of 1930.

New York—Expenditures 1931 at least equal to 1930 ($57,100,000), with possibility of $7,000,000 increase. Contracts advertised to date, $27,376,000, compared with $4,802,000 in 1930.

North Dakota—Construction will be double 1930; all under contract by May 1.

Ohio—Program five to six million dollars less than 1930. Sizable lettings March 24 and April 7.

Oklahoma — Early contracts being awarded. Total work for year about the same as 1930.

Oregon—Expenditure anticipated is $6,000,000; will all be under contract by May 15.

Pennsylvania—Contracts being advertised and will be advertised probably weekly from now on. Program less than 1930; appropriations being considered by legislature.

Rhode Island—Expenditures 1930, $4,800,000; for 1931, $5,000,000.

South Carolina—Contracts let in December, 1930, will increase 1931 construction over 1930. Expenditures have been: in January, 1930, $445,000; January, 1931, $1,275,000; February, 1930, $365,000; February, 1931, $1,750,000.

South Dakota—Expenditures in 1931 about 25 per cent over 1930.

Tennessee—Legislature considering program.

Texas—Contracts to date, 1931, $12,206,000; in 1930, $6,291,000. Slight increase of total work over 1930 is expected.

Utah—Expenditure 1930, $2,750,000; 1931, $4,000,000.

Vermont—Appropriations in legislature; early contracts being let.

Virginia—First half of year contracts will aggregate about $9,000,000.

West Virginia—Expenditures 1930, $13,700,000; in 1931, $17,000,000.

Wisconsin—Construction 1930, $16,000,000; 1931, $20,000,000. Contract lettings below normal to date, but schedule will put all work under contract by time field conditions permit construction.

Federal Highway Funds Being Rapidly Consumed

Washington Dispatch

This year's highway construction program is keeping pace with estimates prepared last January by the U. S. Bureau of Public Roads. To March 1 a total of $111,800,000 had been allocated in federal aid. Emergency loan and state funds against approved plans, compared with an earlier estimate, in terms of contracts let by March 1, amounted to $112,000,000. Allocations made to March 1 on regular federal-aid projects totaled $47,846,000, compared with the January estimate of $48,645,000. Allocations from the emergency loan fund totaled $37,717,000, against an estimate of $49,467,000, and allocations of state funds totaled $20,311,000, compared with the previous estimate of $13,888,000. The total of $105,874,000 is somewhat lower than that reported above, because the bureau's itemized account was closed before notification had been received here of all plans approved to March 1 by district engineers.

Allocations made of $13,839,000 from the $80,000,000 emergency loan fund during the first 21 days of March brought the total up to $51,556,000, leaving an unexpended balance of $28,444,000. Allocations from the emergency fund in January and February had amounted to $15,366,000 and $22,350,000, respectively. Twelve states have practically exhausted their emergency loan fund allotments, and all, with the exception of Pennsylvania and New Hampshire, have drawn against their allotments. The states which have spent practically the whole of their emergency fund allotments include Connecticut, Louisiana, Maine, New York, Texas, South Carolina, Tennessee, Massachusetts, Arkansas and Delaware.

The amount of regular federal-aid funds obligated on approved plans is running far ahead of last year, in spite of the requirement thas makes it incumbent upon the states to complete all projects financed by the emergency fund by Sept. 1. Regular federal-aid funds obligated in January totaled $14,502,000, against $6,988,000 in January, 1930.

The February total amounted to $21,863,000, compared with $7,323,000 in February last year. The total allocated in the first eighteen days of March amounted to approximately $12,000,000, against a total for March, 1930, of $10,080,000. The discrepancy of $11,481,000 between the total of $36,365,000 of federal-aid funds allocated in January and February and the total of $47,846,000 reported above is explained by the fact that the latter total includes previously authorized projects on which both regular federal-aid and emergency loan funds have been authorized.

RAILROAD BUILDER'S MONUMENT

A massive granite monument to the memory of Theodore D. Judah, builder of the first railroad in California, was unveiled recently in Sacramento. The ceremony marked the 75th anniversary of completion of the West's pioneer rail line, a road which ran for 23 miles from Sacramento to Folsom. Mr. Judah later found a route over the Sierra Nevada Mountains for the Central Pacific R.R., parent organization of the present Southern Pacific, and opened the way for the first transcontinental rail line.

Bids Opened for National Hydraulic Laboratory

Sixteen basic bids were received by the Bureau of Standards on March 23 for the construction of its new hydraulic laboratory building. The low bidder for the job is the firm of Stofflet & Tillotson, which submitted a bid of $303,900. The other bids range in the following order: George E. Wyne, $305,400; Arthur L. Smith Co., $313,700; Lee Paschall, $317,000; Laundoun-Rust Co., $319,445; Charles H. Tompkins, $321,850; Skinker & Garrett, $323,878; National Construction Co., $324,900; M. Shapiro & Son, $327,000; Maitico Construction Co., $327,966; Turner Construction Co., $331,000; George Hyman Construction Co., $345,000; W. P. Thurston, $348,000; Boyle-Robertson, $349,500; P. C. Street, $356,000; Bahen & Wright, $358,982.

Bolt and Rivet Association Dissolved by Court

Dissolution of the Bolt, Nut and Rivet Manufacturers Association, Pittsburgh, as a price-fixing body in restraint of trade was ordered March 17 by Judge Frank J. Coleman of the U. S. District Court in New York City. Counsel for the association, which is said to control an annual business of approximately $75,000,000, equal to 95 per cent of the industry's output, agreed to the issuance of the order. Practices forbidden include the compilation and use of preferential lists of customers and the fixing of prices in concert. The 50 members purpose forming a new trade association which will meet the requirements of the government.

Ohio Bill Licensing Engineers Vetoed by Governor

Governor White of Ohio has vetoed a bill which was passed by the legislature proposing to create a state board of registration for professional engineers and land surveyors and to require such engineers and surveyors engaged on public works to be licensed by the board. The governor gave as one of his reasons for the veto that the bill provided that a firm, copartnership or corporation might engage in the practice of engineering and surveying, and he holds that "the professional relationship is essentially a confidential relation to which an impersonal corporation cannot well be a party." Another reason given for the veto was that the bill would require the services of a professional engineer upon any public work costing more than $500, a limit which the governor thinks is too low.

Three Prizes Announced for Beautiful Bridges of 1930

A change in the system of awards for the most beautiful steel bridges erected during 1930 is announced this year by the American Institute of Steel Construction. Three first awards to the most beautiful bridge in each of three classes will be made this year; one to the bridge costing more than $1,000,000; another to the one costing between $500,000 and $1,000,000, and the third to the bridge costing less than $500,000. Selections will be made from bridges opened to traffic during 1930. The award in 1928 went to the Sixth St. bridge in Pittsburgh. Last year the awards went to the Mount Hope bridge in Rhode Island and to the Mount Pleasant bridge in Westchester, N. Y., these being judged to be the most beautiful long-span bridge and the most beautiful short-span bridge erected in 1929.

The jury of awards consists of Francis Lee Stuart, consulting engineer, president of the American Society of Civil Engineers; Robert D. Kohn, architect, president of the American Institute of Architects; Frederick L. Ackermann, architect, of New York; William H. Burr, consulting engineer; and B. F. Betts, editor of the *American Architect*.

The selections will be made by the jury on June 10 and entrants may submit photographs and descriptive data at any time prior to that date to the American Institute of Steel Construction, Inc., 200 Madison Ave., New York.

Owyhee Dam Work Is Resumed Following Winter Layoff

Work on the Owyhee Dam, being built in Oregon for the U. S. Bureau of Reclamation, is proceeding at full speed, concreting having been resumed by the General Construction Co., Seattle, on Feb. 23 after the midwinter layoff on account of cold weather.

The dam is now 52 per cent completed. Tunnel No. 1 is in 3,100 ft. at Connolly's end and 3,300 ft. at Shea's end. Tunnel No. 5 is in 6,600 ft. at Shea's end and 4,375 ft. at Magoffin's. Soft ground and some water has impeded progress at this portal.

Surveys for the distribution system of the project have been carried on throughout the winter.

Concrete Reinforcing Steel Institute Meets in Biloxi

The seventh annual meeting of the Concrete Reinforcing Steel Institute was held in Biloxi, Miss., March 16-18. During the various sessions the following addresses were presented: "The Business Situation, by Rudolph S. Hecht, president, Hibernia Bank & Trust Co., New Orleans; "Tall Reinforced-Concrete Buildings," by Frank E. Brown, consulting engineer, Chicago; "Reinforcing Steel in Concrete Pavements," by Clifford Older, consulting engineer, Chicago; "The Mill Viewpoint," by Robert Gregg, president, Atlantic Steel Co., Chicago; "Credits in the Building Industries," by W. H. Pouch, president, Concrete Steel Co., New York.

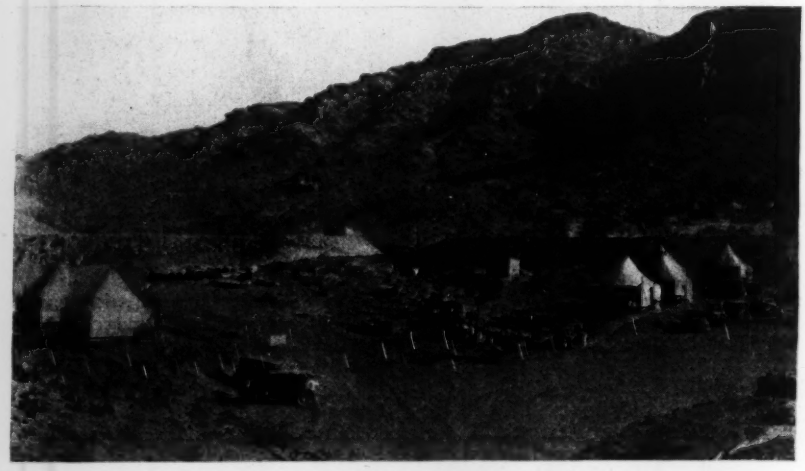
O. W. Irwin, Truscon Steel Co., Youngstown, Ohio, was elected president and Charles M. Gunn, of Gunn, Carle & Co., San Francisco, was elected vice-president. M. A. Beeman was reelected secretary and Hugh J. Baker, of Hugh J. Baker & Co., Indianapolis, was reelected treasurer.

Hoover Dam Notes

Apparently none of the three contractors working at Hoover Dam are running their own camps. The Anderson Commissary Co. is now serving Le Tourneau, Inc., contractor on the Boulder City-Hoover Dam highway, and the Lewis Construction Co., building the government railroad to the dam, and is setting up camp for Six Companies, Inc., contractor for the dam and power house.

The Nevada state legislature on March 18 gave approval to a resolution providing for amending the state constitution so that the state can enter into any contracts necessary for the protection and preservation of any of its natural resources, or for the purpose of obtaining benefits thereof, "arising by or through any undertaking or project of the United States or through any treaty or compact between states or otherwise." The purpose of the proposed amendment is to permit the state to negotiate for the sale of power which Nevada expects to receive from the Hoover Dam.

The tunnel projects at the dam, at least those on the Nevada side of the river, are expected to come under the mining laws of the State of Nevada. Mining inspectors, state and government labor commissioners and representatives of Six Companies, Inc., met with Governor Balzar March 17 to discuss labor problems. Complaints have already been made that the state's minimum wage rate of $4 is not being met.



Construction of highway between Boulder City and Hoover Dam
Camp of Le Tourneau, Inc., contractor on the highway, in foreground.

Allegheny County Plans New Bridge for Homestead

Designs for a new high-level bridge connecting Pittsburgh and Homestead, to be completed in six months, were asked for by the county commissioners of Allegheny County, Pa., on March 17. At the same time the commission voted to issue approximately $3,000,000 in commissioners' bonds to cover the cost of construction. Preliminary plans for the new bridge show a deck cantilever truss with two anchor spans crossing the Monongahela at a point about two blocks downstream from the present Brown's bridge, built in 1894. Such a structure would eliminate two dangerous grade crossings in Homestead and facilitate traffic movement from the eastern section of Pittsburgh toward the southwest and the new municipal airport. It would also eliminate a winding downhill approach that now leads to the present bridge.

Mississippi Barge Line Shows Profit in 1930

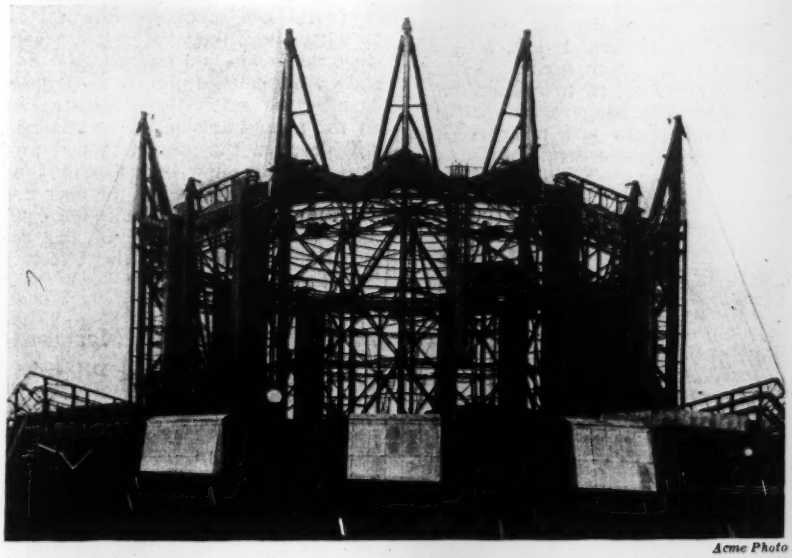
Despite a loss in bulk traffic and unfavorable operating conditions, the Mississippi Barge Line made a net operating income of $65,177.09 in 1930, compared with an operating deficit of $72,798.08 in 1929. This is shown in the annual report of the Inland Waterways Corporation submitted to the secretary of war. Gen. T. Q. Ashburn, head of the Inland Waterways Corp., explained that the earnings for 1930 were largely due to increased operating efficiency. In 1929 the operating expenses were $6,587,081. These were reduced to $5,966,991 in 1930. Another factor that made possible the record of 1930 is the growing practice of shippers to send more valuable cargoes, paying higher rates, over the barge line.

Barge service will be extended up the Illinois River as far as Peoria on July 1. The terminal at Peoria is practically completed now, but the river will not be ready for navigation before July.

Rehearing Granted on Legality of Ohio Bond Issues

The decision of the Ohio supreme court to review the case in which it was recently declared illegal to issue bonds by a political division, the payment of which is guaranteed by the whole division and the benefit to be derived only by a subdivision thereof, has brought an easier feeling regarding sewer and water construction projects. Reaction to the court decision was immediate and powerful in its effect because the validity of a wide range of municipal security issues was placed in question. The decision of the court was noted in *Engineering News-Record*, March 12, p. 457.

Although the date for the rehearing has not yet been set, it is expected that every effort will be made to bring the case before the court as soon as possible, probably by the fore part of next month. In the meantime the seriousness of the situation is indicated by inquiries which reveal that practically all sewer and water line construction in the state is at a standstill. Paving work also is postponed in many cases where sewer and water construction must be done first. Cleveland alone is holding up the issue of $6,000,000 paving and sewer bonds.



Acme Photo

FRAMEWORK OF SUSPENDED DOME BUILDING, CHICAGO WORLD'S FAIR

This circular structure, described in *Engineering News-Record*, Jan. 8, 1931, p. 73, is a part of the large Travel and Transport Building and is planned to house an exhibit of locomotives. The roof, 200 ft. in diameter, is suspended from a system of cables attached to the tops of tall braced columns held vertical by virtue of backstays running down to the ground anchorages outside of the building. There are twelve columns in four groups of three, as shown here.

Driven-Well Water Problems Are Discussed by Drillers

The second annual convention of the American Association of Water Well Drillers was held in Urbana, Ill., March 18-20. At the same time and place the fourth annual convention of the Illinois Water Well Drillers Association was held. The papers and discussions covered a wide range of subject matter, but the majority had to do with improving cooperation, obtaining better construction and a more complete knowledge of the business. Expression also was given to a desire to acquaint the owner or client with the conditions which confronted the well driller at the time he started the contract, many members believing that the owner or client should be taken into the confidence of the drilling profession in order that he might be given an understanding of the problem and the difficulties which the driller encounters.

Among the papers of special interest to engineers in the water-works field were those of C. H. Koyl, engineer of water service, Milwaukee Railroad, on the requirements of railroads in water-supply planning, one by A. M. Buswell, chief of the Illinois state water survey, on well-casing corrosion, and one on the need for cooperative collection of well data by W. D. Gerber, of the Illinois state water survey. The movement of polluted water through sandy soils was discussed by H. R. Crohurst, sanitary engineer, U. S. Public Health Service, Cincinnati, Ohio, and H. O. Williams, of the Edward E. Johnson Co., of St. Paul, described the methods used in the development of gravel and sand wells, together with an outline of the methods of increasing water production from such wells by proper development. H. F. Ferguson, chief sanitary engineer of the Illinois department of public health, in a paper on a sanitary analysis of well waters brought out many points frequently overlooked in obtaining correct sanitary analyses of such waters.

Group to Study Engineering Conditions in Europe

Under the direction of Prof. N. C. Miller, head of the Rutgers University extension division, Europe, including Russia, will be toured by a party of educators and engineers next summer. The engineering division of the tour, under the direction of Parker H. Daggett, dean of the college of engineering at Rutgers, will visit important factories and industrial plants and hold conferences with engineers, business executives and labor leaders. Practical education and engineering will be combined through a course in engineering economics to be conducted en route.

The countries to be visited include Germany, Austria, France, Sweden, Finland, Denmark, Switzerland, Russia and Poland. The party will sail from New York on July 4.

Construction Work in the Hawaiian Islands

According to recent reports from Honolulu more than the usual number of construction jobs have been started in that city. Bids have been asked by the board of water supply on three projects involving the expenditure of $450,000: clearing Nuuanu No. 2 reservoir with the enlargement of the spillway and relocation of the Nuuanu Pali road, the Kaimuki reservoirs and water mains in the lower Wilhelmina Rise and Palolo Valley districts and installation of 16-in. water mains in the Kapahulu-Kaimuki district.

Plans have been announced for three projects to be financed from the $880,000 fund recently made available for Hawaii by the federal government: a 5-mile extension of highway on the Kamehameha system from Wahiawa junction to Kemoo, extension of the Dillingham road to Puuloa and the Kamehameha highway between Kahuku and Hauula.

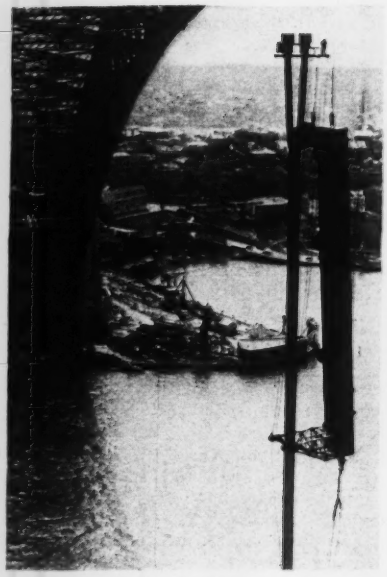
Honolulu has plans for a $2,376,505 road program to extend over the next five years, of which the city will pay $1,263,485, the federal aid will provide $230,000 and assessments will provide the remainder.

Contract for construction of a block of 32 buildings at the Schofield Barracks has been awarded to the Marks Construction Co. for $388,880, and work will be started soon.

Sydney Harbor Bridge Nears Completion

Roadway slab is being poured on the 1,650-ft. steel arch bridge over Sydney harbor in Australia, foreshadowing the completion of this important structure in the near future. The accompanying views give some idea of the progress that has been made since the erection was described in *Engineering News-Record*, Oct. 23, 1930, p. 646.

Upon the completion of the arch steel, Sept. 8, 1930, the two erection travelers were stationed at the center of the span. As they backed off toward the abutment, floor hangers and beams were erected. Ingenious steel girder cradles were utilized in lifting the hangers into place. An accompanying view shows a cradle and a hanger being raised. The hangers are placed in the cradles at the fabricating plant, and the cradles loaded on barges in a horizontal position. They are in fact lifted in the horizontal position until about half way up to the floor steel, when they are up-ended, as shown in the illustration. The platform built at the top end of the hanger provides the steel workers with a substantial footing when making the connections. Cross-girders, 160 ft. long and weighing 95 tons each, are also delivered on barges and raised to connections at the bottom of the hangers. It is reported that two hangers and a cross-girder have frequently been erected in one day.



Erecting a floor hanger on the Sydney Harbor Bridge by means of a plate girder erection cradle

Acme Photo

Steelwork on Sydney Harbor Bridge practically complete

N. J. Senate Accused of Bad Faith on Toll Bridge Bill

Protest to Governor Larson, of New Jersey, by the Port of New York Authority has been evoked by the passage of a bill by the New Jersey Senate authorizing construction by private capital of a toll bridge across Raritan Bay, between New Jersey and Staten Island.

The Port Authority contends that the bill would be unconstitutional as contrary to the contract entered into between the states of New York and New Jersey by which the Port Authority is to have control of all interstate crossings within the port area. For the bill to have binding effect, it would have to be passed by the legislatures of the two states and be signed by the two governors. It is understood that enough opposition exists in the lower house in New Jersey to defeat the bill.

Symposium on Effect of Temperature on Metals

The American Society for Testing Materials, at its annual meeting in Chicago next June, will hold a symposium on "Effect of Temperature on the Properties of Metals," jointly with the American Society of Mechanical Engineers. The various subjects will be fully dealt with in papers which will be preprinted in ample time for digestion before the meeting, and the subject will be thrown open to discussion on all the papers without reading or even abstracting each separate paper. The symposium will deal with the subject from the engineering point of view, one session taking up the needs of the industry, the requirements of different industries and processes, how far and by what alloys they are met at present, what needs are yet unfilled, and especially the trends of process development as affecting materials of construction. At the second session the metallurgists will describe the good and bad properties of alloys now in use or ready for use, and will show what the user must do in the design and operation of equipment to make the most of the good qualities and minimize the effects of the poor ones.

Uniform Highway Markings Urged to Aid Air Pilots

Since paved highways have long been used as landmarks by pilots of aircraft flying cross-country, the aeronautics branch of the U. S. department of commerce has dispatched letters to each of the 48 state highway commissions, requesting their aid in adopting uniform marking methods that are distinguishable from the air. The markings recommended are the official route number preceded by the letters "U. S." for federal highways or by the state abbreviation for state highways. Characters from 10 to 30 ft. high are advised.

76-Mile Gas-Pipe Order Awarded in California

An order for 76 miles of steel pipe amounting to $1,500,000 for a part of the natural gas pipe line from Kettleman Hills to Long Beach, Calif., was awarded the Western Pipe & Steel Company of California by the Southern Fuel Co., newly formed organization controlled by the Southern California Gas Co. and the Southern California Edison Company, Ltd. The contract for the 26-in. diameter pipe calls for fabrication by the automatic electric welding process. The order will require 15,000 tons of steel plates.

This 210-mile steel pipe line is being constructed to transport natural gas from Kettleman Hills to Long Beach for a fuel supply for the Long Beach steam-generating plant for the Edison company. Some of the gas will be marketed for domestic, industrial and commercial uses to consumers in southern California. According to the present schedule, the line is to be put into operation by Nov. 1 of this year.

Federal Trade Commission Takes Up Cement Price Inquiry

Having been directed by the United States Senate to investigate competitive conditions in the cement industry, including the importation of cement, and to report the findings to the Senate, the Federal Trade Commission has delegated the details of the inquiry to its chief examiner, who will cooperate with the commission's economic division, which has already obtained numerous data on the subject through its investigation of price bases. The Senate resolution calls for an inquiry concerning (1) the sale of cement, and especially the price activities of trade associations, (2) the distribution of cement, and (3) activities of the industry in the light of the anti-trust laws.

Plan Proposed to Develop Power on Columbia River

Unique in many respects is the plan of the Columbia River Power Co., Seattle, for developing 160,000 hp. on the Columbia River between Cascade Locks, Ore., and Stevenson, Wash., without a diversion dam. The general plan is outlined in the company's application for preliminary permit to the Federal Power Commission filed recently. Stevens & Koon, consulting engineers, Portland, are consultants on the project.

The scheme proposes to construct along the Washington shore of the river an open canal 6,500 ft. long with its intake about a mile below Stevenson, Wash., above the Cascades. This canal, which will be 300 to 400 ft. wide on the bottom and 75 to 90 ft. deep, will have its bed sufficiently low to divert most of the 90 per cent flow (about 90,000 sec.-ft.). It will deliver water to five tunnels about 7,500 ft. long and 40 to 50 ft. diameter which will discharge into a forebay, into one wall of which will be built the power house near the shore line of the river below the rapids. The difference in elevation between intake and tailrace is placed at 27 ft., which after losses in canal and tunnel will be 23 ft. net head on the wheels, or a capacity of 160,000 hp. 90 per cent of the time.

As a further development to be undertaken later the application states that it is contemplated to build a dam approximately 13 ft. high below the intake which will increase the capacity to 250,000 hp. 90 per cent of the time. The initial development will cost $15,000,000.

WASHINGTON NOTES

By PAUL WOOTON
Washington Correspondent

No Protest on Award of Hoover Dam Contract—Cramton to Be in Charge of Leasing at Boulder City

NO PROTEST has reached the Bureau of Reclamation as a result of the award of the Hoover Dam contract. Some inquiry was made by labor organizations as to how much voice one of the companies composing Six Companies, Inc., would have in the determination of labor policies. The representatives of the union were acquainted with the bureau's experience with the companies and apparently were satisfied that the successful bidder could be relied upon to deal fairly with its workmen. Dr. Elwood Mead, commissioner of reclamation, states that W. H. Wattis can be trusted to cooperate fully with the government. Mr. Wattis for more than 40 years has been doing work on contracts which were under Dr. Mead's supervision.

The Business Outlook

Slow but steady seasonal improvement continues undisturbed by new developments. Steel production, supported by diverse short-range demand, is rising to its spring peak at somewhat more than the usual seasonal rate, and building is beginning to reflect the strong stimulus of public-works contracts. Check payments show the effects of abnormally high government financial turnover. Commodity price movements are encouragingly indefinite, but the spectacular strengthening of silver and an advance in steel are possibly significant. The bond market continues a conservative, exclusive affair, but steady bank buying of non-government bonds is bullish, though as yet insufficient to offset continued unseasonable contraction of commercial credit.

—The Business Week, March 25.

The Parker-Gila reclamation project is an inseparable part of the Hoover Dam development, in Dr. Mead's opinion. By bringing the Gila area into cultivation a great service will be done the people of Arizona and of southern California, he says. Dr. Mead is now en route to Parker to acquire first-hand information as to the area to be irrigated. Congress has already authorized the preliminary examination.

Water-Diversion Decree Entered

A formal decree was entered by the U. S. Supreme Court on March 23 to carry into effect the conclusions in its opinion rendered on Feb. 24 in the water-diversion dispute between Connecticut and Massachusetts. In accordance with the opinion, it is ordered that the bill of complaint brought by Connecticut to enjoin Massachusetts from diverting waters from tributaries of the Connecticut River be dismissed. Right is reserved to Connecticut to bring suit in the future should it appear that interests of the state are injured by increased diversion. Each party is ordered to pay its own costs, and share equally the costs and compensation of the master.

Cramton to Have Charge of Boulder City Leases

Announcement is made that Secretary Wilbur has appointed Louis C. Cramton, of Michigan, former member of Congress, as special attorney to the secretary of the interior, to have charge of appraisal of lands and making leases for residential and business property at Boulder City, Nev., the new town for the workers on Hoover Dam.

Public notice will be given when applications for leases can be filed and it will probably be May 1 before lots will have been appraised and the necessary application blanks prepared for distribution.

Status of Bridge Companies

An investigation was ordered by the Interstate Commerce Commission on March 23 to determine whether the provisions of the interstate commerce act with reference to the issuance of securities and recapture of excess earnings apply to railroad bridge companies. The status of the companies is doubtful because they are not included specifically in the definition of carriers. The commission's order named the following fifteen companies: Keokuk & Hamilton Bridge Co., Leavenworth Terminal Railway & Bridge Co., Shreveport Bridge & Terminal Co., Winona Bridge Railway Co., Dunleith & Dubuque Bridge Co., Arkansas & Memphis Railway Bridge & Terminal Co., Atchison & Eastern Bridge Co., Covington & Cincinnati Elevated Railroad & Transfer & Bridge Co., Louisville & Jeffersonville Bridge & Railroad Co., Kentucky & Indiana Terminal Railroad Co., Missouri & Illinois Bridge & Belt Railroad Co., Southern & Illinois Bridge & Belt Railroad Co., Wilmington Railway Bridge Co., Sault Ste. Marie Bridge Co. and Sioux City Bridge Co.

Obituary

CHARLES PAUL, who recently retired as president of the Federal Pipe & Tank Co., of Seattle, Wash., died on March 16, at the age of 40 years. Mr. Paul had been in business in Seattle since 1909.

R. R. NELSON, former water commissioner of Dallas, Tex., died recently at the age of 73. Mr. Nelson served the city as water commissioner in 1911-13 and previously as secretary to the city water system from 1893 to 1911. He worked constantly for filtration and purification in those days when city water was delivered to Dallas consumers with a large amount of sand and silt.

A. L. VALENTINE, of Seattle, Wash., for the past seven years in charge of engineering work for the Seattle & Rainier Valley Railway Co., died in Seattle on March 12. From 1887 to 1890 Mr. Valentine was in the city engineer's office in Seattle and afterward for nine years was on the engineering staff of the Northern Pacific R.R. Later he became superintendent of public utilities is Seattle, an office which he held for nine years.

HENRY A. SYMONDS, of Boston, Mass., well known through New England as a consulting engineer specializing in water-works construction, died of heart disease recently in his office. Mr. Symonds, who was 59 years old, was a member of the New England Water Works Association and served as editor of the association's *Journal* from 1917 to 1923. He was also a member of the American Water Works Association.

RICHARD J. CULLINAN, assistant counsel to the New York board of transportation, died suddenly from a heart attack on March 23. Mr. Cullinan, who was 42 years old, was graduated in civil engineering from Manhattan College, and later, while holding city engineering positions, studied law and was admitted to the bar in 1920. After serving in the topographical bureau, Borough of Richmond, in the department of water supply, gas and electricity, in the Public Service Commission for the First District, in the transit construction division and in the board of transportation in engineering capacities, he was made assistant counsel in 1927.

LEVERETT S. MILLER, for 45 years a builder and manager of railroads in the United States and until recently president of the New York, Westchester & Boston Ry., died in New York City on March 14. He was 65 years old. Mr. Miller, after his graduation from Rensselaer Polytechnic Institute in 1885, was appointed maintenance engineer for the Denver, Utah & Pacific R.R. Later he was engineer for the Colorado Railway Co., chief engineer of the Eastern Alabama Ry., assistant resident engineer of the Thames River bridge, assistant superintendent of the New York, Providence & Boston R.R., chief engineer and later assistant general manager of the St. Paul & Duluth R.R., and general manager of the Seattle & International R.R. He had also served as assistant to the president of the Erie R.R., general manager of the Tennessee Central Ry., general manager of the Tennessee Construction Co. and general manager of the Central New England Ry. Mr. Miller was an early advocate of bus transportation as a supplement to railroad service.

J. L. STANNARD, chief engineer of the department of public utilities, Tacoma, Wash., died in Glendale, Calif., on March 13, after an illness of less than a month. Mr. Stannard had been the genius behind the development of the Cushman power project under construction by the city of Tacoma, of which the second unit is rapidly nearing completion. From 1907 to 1910 he was assistant city engineer, Seattle, Wash., in charge of construction of the second unit of the Cedar River water supply and the second unit of municipal lighting plant. After 1910 he was for a time in private practice in Portland, on water-works and power problems. He designed and installed water systems at Falls City, Toledo, Carlton, Cornelius and Hillsboro, Ore., and Woodland, Wash., and a hydro-electric plant for Baker City, Ore. He also acted as consulting engineer for Centralia, Wash., and Oregon City, Ore., on new gravity water supplies. He went to Tacoma in 1923. Mr. Stannard was serving his second term as president of the Tacoma section, American Society of Civil Engineers, which he was instrumental in forming.

SOCIETY CALENDAR

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York; spring meeting, Norfolk, Va., April 15.

AMERICAN WATER WORKS ASSOCIATION, New York; annual convention, Pittsburgh, Pa., May 25-29.

AMERICAN WELDING SOCIETY, New York; annual meeting, New York City, April 22-24.

AMERICAN SHORE AND BEACH PRESERVATION ASSOCIATION will hold its spring meeting in Norfolk, Va., April 13 and 14, immediately preceding the meeting of the American Society of Civil Engineers. The program will include a few papers and an inspection of the shore frontage on which protective measures have been carried out or are in preparation.

AMERICAN SOCIETY FOR TESTING MATERIALS will hold its 34th annual meeting in Chicago, June 22-26. An exhibit of testing apparatus and machines will be held in conjunction with the meeting.

LOS ANGELES SECTION, American Society of Civil Engineers, at its monthly meeting on March 11 heard an illustrated talk on the Mono Basin water-development program by Edgar A. Bayley and William W. Hurlburt, of the Los Angeles department of water and power. Merrill Butler, engineer of bridges and structures, bureau of engineering, Los Angeles department of public works, discussed the design and construction of the Fourth St. viaduct across the Los Angeles River. Hinging of the arch ribs during construction to relieve secondary stresses make this an interesting structure.

NATIONAL MUNICIPAL LEAGUE will hold its next convention at Buffalo, N. Y., Nov. 9-11. Russell Forbes, 261 Broadway, New York City, is the secretary.

Brief News

FUSION of the water and sewer departments into a new municipal department for purposes of economy has been accomplished in Montreal, Canada. J. A. Jette, former head of the water department, will be superintendent-engineer of the new department.

RECOMMENDATION for the construction of a new bridge from East 86th St. Manhattan, crossing the East River, touching the northerly end of Welfare Island, to Broadway and 85th St., in the Astoria section of Queens, all in the city of New York, has been made by Borough President Harvey, of Queens.

AT LEAST $3,000,000,000 will be spent on roads and road construction during 1931 by 110 nations and political subdivisions of the world, according to an estimate made by the automotive division of the U. S. Bureau of Foreign and Domestic Commerce. The bureau states the United States leads in this construction, with expenditures which, according to the best estimates, will reach $2,000,000,000 during the year.

HIGHWAY CONSTRUCTION WORK for this year by the four western provinces of the Dominion of Canada will involve a total cost of about $60,000,000. The bulk of this will be for roads, although there will be some expenditure for bridges. Keen competition exists among companies supplying roadmaking materials, and much interest attaches to tests as to the comparative values of cement, crude oil and Alberta tar sands.

A LANDSLIDE on March 18 at the mouth of the tunnel about a mile from Keddie, Calif., on the railroad extension being built by the Western Pacific R.R. from Keddie to Bieber in northern California took the lives of five men. The cause of the slide is believed to be the heavy rain the previous day, which loosened the rock and shale on the mountainside. The tunnel had been driven only about 10 ft.

CONSTRUCTION has been suspended on the $2,000,000 department of agriculture building in Washington, following the receivership of the Nelson-Pedley Co., of Philadelphia, which had the contract to complete the building by October. The receivership followed an adverse decision in the Pennsylvania courts whereby the Nelson-Pedley Co. was held liable for a $750,000 fire loss on the completed state educational building at Harrisburg, Pa.

CONTRACT for the structural steel for Metropolitan Square, covering the three blocks in New York City between Fifth and Sixth Aves. and 48th and 51st Sts., has been let by the Todd, Robertson, Todd Engineering Corp. and Todd & Brown, Inc., representing John D. Rockefeller, Jr., to Post & McCord. The steel, which will amount to about 125,000 tons and will cost in the neighborhood of $10,000,000, will be supplied by the American Bridge Co., a subsidiary of the United States Steel Corp. The project was described in *Engineering News-Record*, March 12, p. 455.

Construction Equipment and Materials

Lock-Bar Pipe Tested for High-Pressure Gas Service

A series of specification tests recently made on 30-in. diameter steel pipe with lock-bar longitudinal joints has demonstrated the suitability of this class of pipe for high-pressure gas and water service. These tests were made at the Lock-Bar plant at Leetsdale, Pa., by the East Jersey Pipe Co. under the supervision of one of the largest constructors of gas lines in the country. The purpose was to determine the suitability of this type of pipe for high-pressure gas line service, so that bids could be entertained upon it in connection with future projects. A 30-in. size was chosen because it is 2 in. larger than any high-pressure gas line now in service or under construction.

Each end of five 28-ft. pipe sections made up of ⅜-in. plate was fitted with a hemispherical head projecting inside

Typical break in pipe
Showing method of attaching head.

the pipe, a shoulder having been machined off to bring the outside of the head flush with the exterior surface. The circumferential joint was welded, and additional spot welds added at adjacent punch holes, as is illustrated above. All sections failed in the plate, no signs of distress being noted along the lock-bar joint. Pressures at failure ranged from 1,080 to 1,200 lb. per sq.in.; increase in circumference ranged, generally, from 5 to 7 in. A 12-in. increase in circumference noted for pipe No. 5 (see table) resulted from the fact

DESTRUCTIVE TESTS OF 30-IN. LOCK-BAR PIPE

Pipe No.	Breaking Pressure, Lb. Per Sq.In.	Strength of Plate, Lb. Per Sq.In.	Increase in Circumference In.
1	1,160	61,430	7
2	1,080	56,950	7
3	1,200	57,930	5¼
4	1,140	56,270	5
5	1,140	60,430	12

that the approximate breaking pressure was maintained for 30 minutes before failure, due to a leak around the welded head.

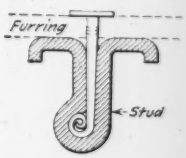
Previous tests of 42x⅜-in. lock-bar pipe for water-supply mains have been made in which a pressure of 1,050 lb. stretched the pipe more than 4 in. in circumference, but bursting could not be accomplished due to leaks in the riveted connection, according to East Jersey Pipe Co. officials.

These tests indicate that lock-bar pipe provides a suitable factor of safety for the usual pressures now used in gas, as well for water lines under pressures ranging from 350 to 500 lb. per sq.in.

The five 30-in. pipe sections after being tested to destruction

Nailing Furring to Steel Studs

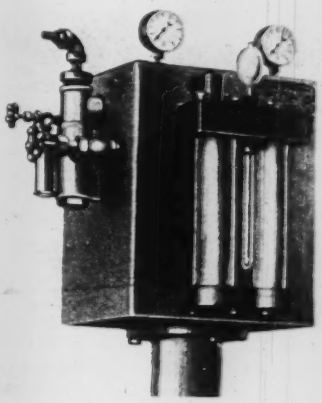
Announcement has been made by the Wheeling Corrugating Co., Wheeling, W. Va., of a system of partition erection by which nails are used to fasten lumber, lath, wallboard or insulation directly to steel furring. This is made possible by the use, as an integral part of a steel stud, of a strip of heavy steel rolled into



a T-shape with a bulb formed in the stem of the T. Driving a nail into the slot of the T forces it to follow the contour of the bulb and return upon itself, riveting in such manner that it is impossible to withdraw the nail without breaking. Studs are furnished in proper depths to make walls 2, 4 and 6 in. thick. These studs are completely assembled and ready to set into place on the job, the only erection tool required being a hammer to drive in the nails. All parts of the system, including the special nails, are made of Cop-R-Loy copper alloy steel.

Chlorinator for Small Supplies

Equipment to handle small amounts of chlorine for the treatment of water in the average small-water-works has been devised by Wallace & Tiernan Co., Inc., Newark, N. J., in the type MSP

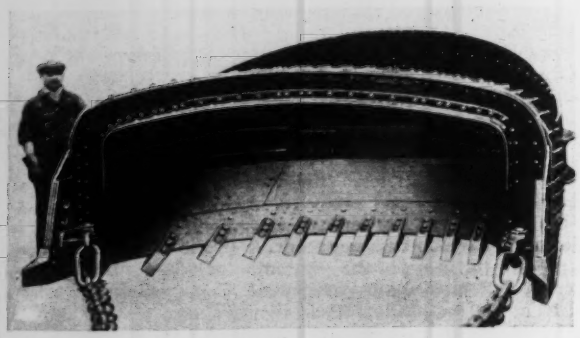


Chlorinator for small flows

chlorinator. Not only does this machine accurately control the small amount of chlorine necessary but its simple construction is readily understood by the practical water-works man. All control parts are on the outside, and a removable hood makes possible complete inspection at any time. Reliefs are provided to prevent moisture from being drawn back into the chlorine gas control parts, and also to prevent the escape of gas into the room in the event of accidental failure of the auxiliary water supply. The machine is also adapted to the small sewage-disposal plant. It can be erected at any convenient point, since no preliminary foundation or mounting is required.

Scraper Bucket Has Capacity of 12 Cu.Yd.

Development of drag scrapers in larger and larger sizes, particularly for levee building operations along the Mississippi River, has led to the construction of several Crescent drag scraper buckets of 12-cu.yd. capacity by Sauerman Bros., Inc., 438 South Clinton St., Chicago, Ill. One of these buckets is illustrated. It stands almost 6 ft. high



12-cu.yd. drag scraper bucket

and measures 11 ft. across. Although this bucket will bring in a load of from 16 to 17 tons of earth, it weighs only 5½ tons equipped with chains and teeth. Similar buckets are available in sizes ranging from ¼ cu.yd. to 12 cu.yd.

Oil-Impregnated Bearing Metal

Research by engineers of the Chrysler Corporation, Detroit, Mich., has resulted in the development of a new self-oiling bearing metal which has been christened Oilite because of its properties. The material is an alloy of copper, tin and other metals. It is subjected to tremendous pressure, heat-treated and then impregnated with hot oil in a vacuum, absorbing up to 40 per cent of oil by volume. Oilite, it is claimed, has a strength much greater than that of ordinary self-oiling bearing materials, averting delays and breakage in assembly. Due to the high oil content, a hydraulic cushion exists which permits bearing loads in excess of those carried by conventional materials. It can be adapted to many bearing uses and is already in service in spring shackles, water pump bearings, clutch pilot bearings, steering gears and other positions on automobiles manufactured by the Chrysler Corp. Commercial sales are in charge of Amplex Mfg. Co., 7900 Joseph Campau Ave., Detroit, Mich., a division of the Chrysler Corp.

Power-Driven Unit Rigged as Mower or Snow Plow

A simple wheel-mounted framework equipped with a two-cylinder 12-hp. LeRoi motor as a power source is used as the foundation for two special pieces of equipment developed by the Centaur Tractor Corp., Greenwich, Ohio, for either mowing weeds or clearing snow from sidewalks. These functions are accomplished by the attachment of suitable auxiliary equipment. For the mower this consists of a 5- or 6-ft. cutter bar fitted with standard knife or sickle, knife guards and a special patented shield on the outside end. The mower can be adjusted to cut at any angle between 30 deg. up and 30 deg. down or over a berm or curb. Control of the blade is centered in a foot pedal.

The snow plow unit consists of a simple V-plow mounted in front of the chassis which is raised or lowered by a hand-operated worm gear device.

Light motor-driven snow plow

COSTS AND CONTRACTS

E. N.-R. Index Numbers

Cost		Volume	
Mar., 1, 1931	194.51	February, 1931	198
Feb. 1, 1931	196.61	January, 1931	208
Mar. 1, 1930	206.80	February, 1930	204
Average, 1930	202.85	Average, 1930	260
Average, 1929	207.02	Average, 1929	317
1913	100.00	1913	100

This Week's Contracts

Heavy construction contracts, reported by *Engineering News-Record* in the week of March 26, with some comparisons, total as follows:

(In Thousands of Dollars)

	Mar. 26 1931	Average of Last Four Weeks 1931	1930
Buildings:			
Industrial	$1,843	$4,141	$12,856
Other	22,896	16,053	34,511
Streets and roads..	15,341	13,347	11,240
Other eng. constr..	9,673	29,218	39,349
Total	$49,753	$62,760	$97,958
Total, all classes Jan. 1 to March 26:			
1931			$666,777
1930			826,157

Contracts Down 15 Per Cent From Year Ago

New securities issued in the first three weeks of March totaled 398 millions, compared with 520 millions a year ago. The cumulative total for the year is 1,016 millions, compared with 1,766 last year, a drop in financing of 42 per cent. Largest two issues of last week were $15,000,000 for Detroit and $9,557,000 4½s for the State of North Carolina.

Contracts let in the first three weeks of March totaled 202 millions and included 48 for Hoover Dam, compared with 296 millions a year ago, which included 106 millions for telephone construction. Cumulative totals for the year to date are 617 millions for 1931 and 730 for 1930.

New Publications

Railway Equipment—Cars and locomotives developed especially to meet the requirements of central stations and large industrial power plants are described in a 16-p. bulletin of the ATLAS CAR & MFG. Co., Cleveland, Ohio.

Welding—A 20-p. bulletin listing supplies for arc welding, ranging from portable welders to protective clothing, has been issued by the LINCOLN ELECTRIC CO., Cleveland, Ohio.

Testing—Accomplishments of the PITTSBURGH TESTING LABORATORY, Pittsburgh, Pa., during the past 50 years are recorded in a 32-p. illustrated bulletin issued by that company.

Ash Conveyors—Principles of operation and fields of application for the Nuvey ash-removal system are outlined in a 20-p. illustrated bulletin of the UNITED CONVEYOR CORP., Old Colony Bldg., Chicago, Ill.

Welded Fittings—Two new lines of fittings made by a special process involving forging in two halves and then electric machine welding are described in a 12-p. circular 236 prepared by the Crane Co., 836 South Michigan Ave., Chicago, Ill.

Drag Scrapers—Catalog 14, issued by SAUERMAN BROS., INC., 438 South Clinton St., Chicago, Ill., contains a detailed description of Sauerman power drag scraper equipment, accompanied by photographs and operating data. Various fields of activity in which this equipment is used is treated in separate chapters. The booklet contains 72 pages and many illustrations. An entirely new section on tower machines has been added, showing the latest improved mobile equipment for the construction of levees and embankments or for any type of work where the scraper must make long continuous cuts or fills.

Business Notes

SOUTHERN PINE ASSOCIATION, New Orleans, La., announces that manufacturers of longleaf pine are prepared, through the association, to furnish certificates of species to shippers of their products.

FULLER LEHIGH CO. has transferred its general offices from Fullerton, Pa., to 85 Liberty St., New York, N. Y. Manufacturing operations formerly carried on at Fullerton are transferred to Barberton, Ohio.

CANADIAN WESTINGHOUSE CO., LTD., Hamilton, Ont., is planning expansion on a large scale. Its manufacturing equipment will be increased to permit the production of new lines of electrical goods. The plan also calls for the opening, from coast to coast, of about 2,300 retail outlets through already established stores.

THOMAS R. AKIN, president of the Laclede Steel Co., St. Louis, Mo., has been elected president of the Mancha Storage Battery Locomotive Co., also of that city. He succeeds Raymond Mancha, who died Jan. 3, 1931. Other officers of the company remain unchanged.

TRUSCON STEEL CO., Youngstown, Ohio, announces the appointment of Clark P. Pond as vice-president, engineering and sales. Mr. Pond was formerly connected in a similar capacity with the David Lupton's Sons Co.

JEFFREY MFG. CO., Columbus, Ohio, has opened a direct factory branch office at 602 Esperson Building, Houston, Tex. Thomas P. Burke is district manager in charge.

BROWNING CRANE & SHOVEL CO. is the new name adopted by the organization formerly known as the Browning Crane Co., Cleveland, Ohio. There has been no change in personnel or products.

HOWARD INSPECTING AND TESTING LABORATORY, INC., 234 Mount Prospect Ave., Newark, N. J., has been formed by J. W. Howard to carry on the work which he has done for years as an individual.

WALTER S. DICKEY, chairman of the board of the W. S. Dickey Clay Mfg. Co., Kansas City, Mo., died on Jan. 22.

HARRY P. READMON, for the past twelve years purchasing agent for the Chicago Pneumatic Tool Co., New York City, died on Feb. 26 at the age of 53.

Current Construction Unit Prices

Wards Island Sewage Treatment Plant for New York City

BIDS on contract B, covering that part of the Wards Island activated-sludge sewage-treatment works involving the construction of preliminary and final settling tanks, aeration tanks, substructures for operating galleries, preliminary and return sludge pumping stations, and foundations for sludge storage and decantation tanks, were opened March 9, 1931, by the department of sanitation, New York City. The low bid, $3,867,780, by W. H. Gahagan, Inc., Brooklyn, is so low that the department has postponed letting until the situation can be studied. Spread between low and second is 15 per cent, and between low and average 25 per cent. Eighteen bids were submitted.

Work included in contract B has been laid out in nine divisions, of which the largest (AA) includes: clearing site of existing structures; sixteen reinforced-concrete aeration tanks 345x88 ft. by 15 ft. deep, divided into four channels by concrete baffle walls equipped with diffuser plates; a 2,200-ft. water line to the site; 3,350 ft. of 10-ft. woven wire fence; all equipment in aeration tanks and substructures of operating gallery. Costs of the principal items as compared with the low bidder's total price for the division are: excavation, 16½ per cent; cement, 11 per cent; reinforcing bars, 18; concrete, 34. The next four divisions are alternates based on different types of sludge removal mechanisms.

Division BB—Eight reinforced-concrete preliminary settling tanks 100 ft. square by 15 ft. deep, equipped with sludge removal mechanisms of the *revolving type*, arranged for grease skimming, together with conduits and piping in the structures and between them and the preliminary sludge pumping stations of division FF.

Division CC — Same as BB, but with *conveyor type* mechanisms.

Division DD — Thirty-two concrete final settling tanks, each with a surface area of 7,500 sq.ft. and 12 ft. deep, with sludge removal mechanisms of the *revolving type*, with conduits and piping in the structures and between them and the operating galleries.

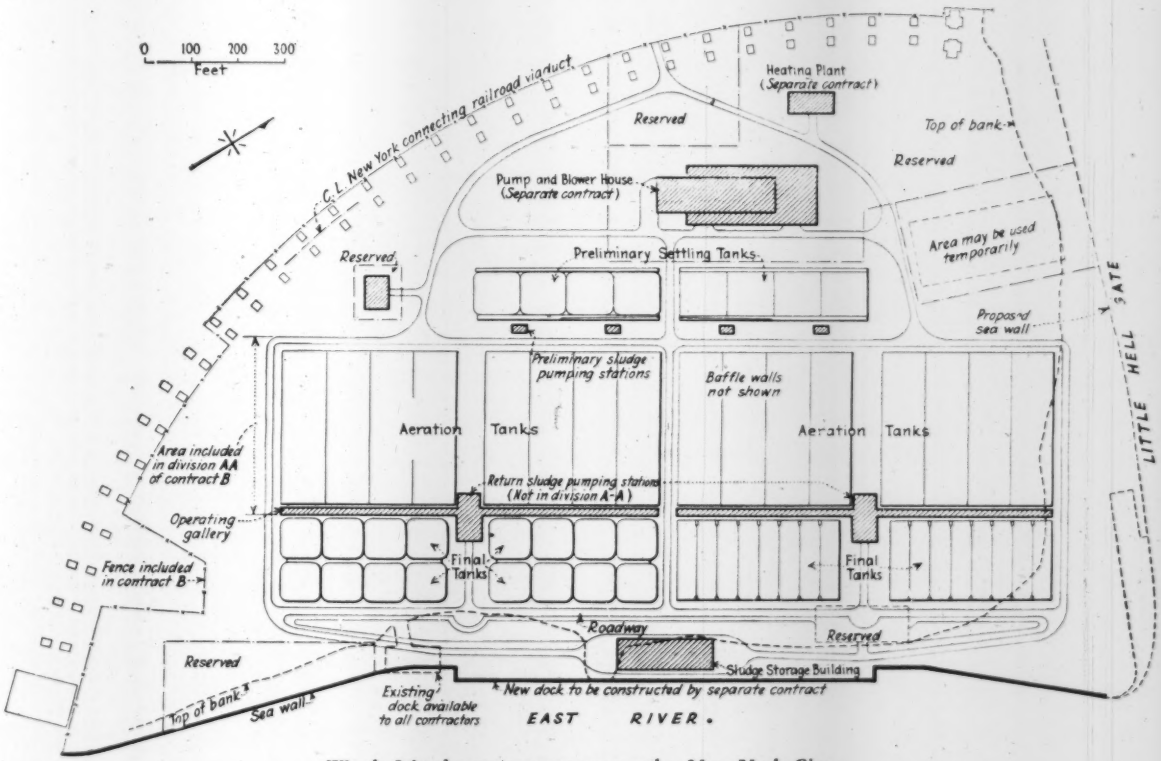
Division EE — Same as DD but with *conveyor type* mechanisms.

The other four divisions cover: (FF) foundations of four preliminary sludge-pumping stations each 32x19 ft. in plan by 16 ft. deep and of two return sludge-pumping stations each 121x46 ft. by 17½ ft.; (GG) all pipelines and equipment not included in foregoing six divisions; (HH) concrete pile and girder foundations for sludge storage and decantation tanks covering an area 200x70 ft.; (JJ) disposal of excess excavation.

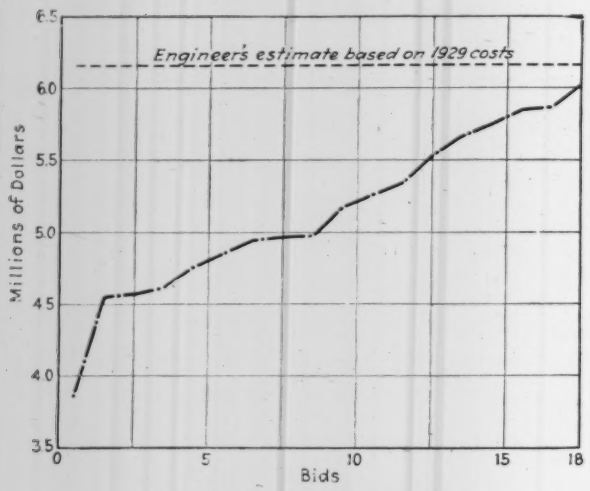
On the whole contract the difference between the low and the second bid was $693,952. Of this difference $565,322, or 82 per cent, was in division AA and was chiefly in the concrete items (excluding cement), which ranged from $4.24 for class C to $9.99 for class A, compared with a range of $7 to $14.50 for the second bidder. This difference in concrete bids amounted to $352,000 on a quantity of 65,060 cu.yd. There are concrete items also on the other divisions, but the low bidder's estimates are considerably higher on these and are comparable with those of the second bidder, as shown below. The principal concrete items are classes A and B. Mix for either is 1:2:4, and class A is used where finished forming is required, as in beams, walls, slabs not resting on earth, and walls of conduits; class B is used

BIDS ON CONCRETE EXCLUSIVE OF CEMENT

	BB				DD		
	Bbl.	A	B		Bbl.	A	B
A	4,950	$13.01	$12.01	A	11,900	$11.68	$12.00
B	5,150	5.31	10.50	B	13,500	5.26	10.00
C	450	3.91	7.00	C	6,500	3.91	7.00
	CC				EE		
A	5,300	15.40	13.25	A	11,000	11.29	12.50
B	5,400	4.83	10.50	B	13,600	4.53	10.00
C	180	3.91	7.00	C	4,500	3.91	7.00



Wards Island sewage-treatment works, New York City



Range of bids, Wards Island plant

where no forms or only rough forms are required, as for tank floor slabs, wall bases and footings, floors of valve chambers, and mortar finish for tank floors. Class C is 1:3:6 and is used for filling below grade.

The regularity of the machinery bids is shown in the following comparison of low, second and average.

	A	B	Average
Preliminary settling tanks			
BB revolving removal	$133,060	$133,000	$146,815
GG conveyor removal	115,092	118,000	138,474
Final settling tanks			
DD revolving removal	235,415	235,000	260,308
EE conveyor removal	248,600	263,000	298,806

Unit prices of materials in division AA are given of the lowest four bidders: A, W. H. Gahagan; B, Federal Construction Corp., 319 Lafayette St.; C, Lyons-Slattery Co., Inc., 2432 Grand Concourse; D, Cornell Contracting Corp., 405 Lexington Ave. These contractors were also the four lowest of the 18 bidders on the whole contract B, and their total bids were: A, $3,867,780; B, $4,561,732; C, $4,575,623; D, $4,607,359. Fuller & McClintock, 170 Broadway, New York, are the engineers. L. C. L. Smith is engineer member of the sanitary commission.

UNIT PRICES ON DIVISION AA, WARDS ISLAND PLANT

	A	B	C	D
3,400 lin.ft. fence	$3.01	$3.00	$4.50	$2.20
224,000 cu.yd. earth excav.	1.51	.60	.91	.46
7,700 cu.yd. excav. below El. 0.0	2.50	.75	3.00	1.30
35,500 cu.yd. rock excav.	3.58	5.50	2.75	3.10
6,000 cu.yd. compacting materials	.20	.50	.90	.39
14,200 ft. tile drains	.496	1.00	.33	.35
104,000 bbl. cement	2.19	2.10	2.46	3.11
36,200 cu.yd. class A concrete*	9.99	14.50	3.65	11.42
27,100 cu.yd. class B concrete*	4.25	11.00	9.35	4.56
1,760 cu.yd. class C concrete*	4.24	7.00	9.35	4.43
77,400 sq.ft. rubbed finish	.04	.06	.11	.065
14,250 sq.ft. conc. floor hardener	.01½	.01½	.01½	.016
164,000 sq.ft. waterproofing conc.	.05	.03	.07	.044
700,000 lb. reinf. bars	.0323	.04	.037	.043
1,320 tons c.-i. pipe	51.75	70.00	81.00	90.00
Totals, Division AA	$2,042,367	$2,607,689	$2,526,448	$2,598,725

* Exclusive of cement.

Dredging in Georgia

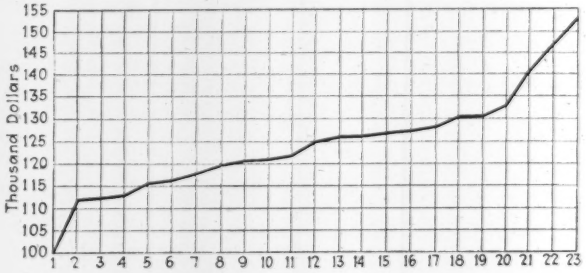
DREDGING work in the Black and Turtle rivers in the vicinity of Brunswick, Ga., is covered by two contracts let in January, 1931, by the U. S. Engineer Office at Savannah. Major D. L. Weart is district engineer. The Black River work covers 218,000 to 257,000 cu.yd. of mud, sand and shell, from a point 1,000 ft. below the mouth of Mill Creek to a point 4,500 ft. downstream in Black River, which is a tidal stream connecting at its lower end with St. Simon Sound. River width varies from 700 to 1,200 ft., with depths of from 11.5 to 30 ft. below mean low water. A channel is being dredged to 21 ft. below m.l.w., with bottom 150 ft wide. The average rate of removal is to be 25,000 cu.yd the first month, 50,000 cu.yd. thereafter. Tide range is 7 ft. A hydraulic plant is used, material being deposited on the westerly shore 1,000 to 2,000 ft. distant. The contractor is the Globe Dredging Co., Savannah, at 12¾c. per cubic yard.

Turtle River is in two sections: 370,000 cu.yd. at Brunswick Point; 267,250 cu.yd. at Middle Turtle River and Upper Turtle River, Brunswick Harbor. Sec. 1 is (*a*) a channel to 27 ft. below m.l.w., 400 ft. wide at the bottom and 11,200 ft. long, and (*b*) another channel of the same depth, 300 ft. wide and 5,500 ft. long. Sec. 2 is (*a*) a channel 27x300 ft., 5,100 ft. long; (*b*) 27x300 ft., 7,000 ft. long. Tide range is 6.6 ft. in Sec. 1 and 7.5 ft. in Sec. 2. Material is placed by a 1,500-ft. pipeline from the hydraulic dredge. Contractor is the Atlantic Gulf & Pacific Co., New York, at 74c. per cubic yard for both hard and soft material.

Concrete Road and Bridge in Pennsylvania

IMPROVEMENT of 2,260 ft. of state highway and the construction of two spans of steel and concrete were placed under contract by the Pennsylvania department of highways in December, 1930, for $101,189. The section concerned extends through East Wheatfield, Indiana County, and will be paved with 9- to 7-in. concrete, 18 ft. wide, with 7-ft. shoulders.

The bridge consists of one deck-truss span 134⅝ ft. c. to c. of bearings, with an underclearance of 15 ft., at a skew of 53 deg. 53 min. over Black Lick Creek, and one through plate-girder span 91 ft. 7½ in., with under clearance of 23 ft. 9¼ in., one end at a skew of 90 deg. and the other end of 53 deg. 53 min., over Black Lick Branch of the Pennsylvania R.R. Both spans have a clear roadway of



Bids for paving and bridgework at East Wheatfield, Pa.

23 ft. and are on a 5 per cent grade. They are carried on reinforced-concrete abutments, and have an over-all length of 233 ft. 11 in.

Estimates were received from 23 contractors, with a range shown in the diagram. The average price was $125,000. Contract was awarded to Welsh Construction Co., Pittsburgh, for $101,189. Contract unit prices are given and those of the next two bidders: B, Whiting-Turner Construction Co., Baltimore, and C, L. M. Hutchison, Orbisonia.

	A	B	C
28,177 cu.yd. class 1 excav., grading	$0.50	$0.75	$0.60
2,893 cu.yd. class 2 excav., structure	1.00	3.90	1.75
Clear and Grub.:			
4,549 sq.yd. subgrade	.15	.15	.20
1,982 lin.ft. shoulders	.15	.30	.20
10 sq.yd. 1 c. pl. conc. pvt. 6-6 in.	3.00	2.50	3.00
4,539 sq.yd. 1 c. reinf. conc. pvt, 9-7 in.	3.00	2.80	2.90
461 sq.yd. reinf. conc. wear. surf.—br. fls	2.50	2.15	2.50
300 cu.yd. class "A" conc	22.00	18.65	22.00
1,899 cu.yd. class "B" conc	16.00	14.75	17.00
163,536 lb. plain steel bars	.03	.033	.04½
95 cu.yd. stone back-fill-bridge	3.00	2.50	5.00
176 lin.ft. reinf. conc. pipe 15 in.	2.50	1.90	3.00
980 lin.ft. tile underdrain 4 in.	.50	.40	.90
30 lin.ft. tile outlets 4 in.	1.00	.50	.90
581 sq.yd. plain conc. gutter	2.50	3.00	2.75
121 cu.yd. stone slope wall	15.00	3.00	8.00
396,000 lb. fab. struc. steel	.04½	.05	.053
Removing old bridge (lump sum)	1,000.00	550.00	350.00
3,540 sq.ft. gunite	.75	.62	.70
500 lb. gauge annealed iron wire No. 4	.15	.05	.10
88 cu.yd. old conc. pavement removal	2.00	1.50	2.50

CONSTRUCTION NEWS

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Some of the Week's Large Projects

For further details turn to the appropriate sections in this issue.

Location	*Project*	*Cost*	*Status*
Waterworks			
Minneapolis	Reservoir	$2,180,000	Proposed
Grade Crossings			
Framingham (Mass.)	Grade elimination	6,500,000	Proposed
Unclassified			
Colorado, etc.	Telephone impvts.	8,000,000	Proposed
Federal Government			
Newark (N.J.)	Post Office	6,150,000	Proposed
Mills and Factories			
London (Ont.)	Gas plant	1,000,000	Proposed
Buildings			
Elmhurst (N.Y.)	Hospital	2,500,000	Proposed
New York	Office	5,000,000	Proposed
New York	Stock exchange addition	10,0000,00	Proposed
Newtown (Conn.)	Insane asylum	1,250,000	Proposed
Indianapolis	State library	1,000,000	Proposed
St. Louis	Museum	2,500,000	Proposed
San Francisco	Medical school and hospital	2,500,000	Proposed
Chicago	Junior high schools	4,500,000	Bids asked
New York	Stores and apartments	1,000,000	Proposed
Lawrence (Mass.)	Theatre	1,000,000	Contract
New York	Radio City (steel)	10,000,000	Contract
San Francisco	War memorial	2,500,000	Proposed

WATERWORKS

PROPOSED WORK

Calif., Manteca — Surveys extending waterworks into southeast section. $15,000 or more. E. R. Van Sandt, city water supt.

Ind., Edinburg—Town Bd. new watermains. $15,000. S. Quear, Edinburg, engr.

Ind., Pendleton — Town Board waterworks. $15,000. C. Roberts, Pendleton, chn.

Ia., Estherville—City, c/o City Clerk, water filtering, softening plant. Howard R. Green, 417 1st Ave., Cedar Rapids, engr.

Mass., Bedford—Town, Bd. Selectmen, waterworks extension, improvements on Dudley Rd., Sweetwater and Lane Aves. $15,100 appropriated.

Mass., Belmont—Town, Bd. Selectmen, waterworks extensions. $36,600 appropriated.

Mass., Bourne—Town, H. Watts, chn. Bd. Selectmen, preliminary sketches waterworks in Buzzards Bay. To exceed $15,000. Whitman & Howard, 89 Broad St., Boston, engrs.

Mass., Fitchburg—City, Dpt. P. Wks., waterworks improvements. $73,600 appropriated.

Mass., Natick—Town, Bd. Selectmen, waterworks extensions, improvements. $44,850 appropriated.

Mass., Northboro—Town, Bd. Selectmen, waterworks extensions. $16,000 appropriated.

Mass., Saugus—Town, Bd. Selectmen, new mains in Cliftondale Sect. $23,000 appropriated.

Mass., Rockport—Town preliminary surveys, standpipe, Pigeon Hill. $25,000. Metcalf & Eddy, Statler Bldg., Boston, engrs.

Mass., Somerset—Town, Bd. Selectmen, main extension to South Somerset, for fire protection. $15,000 or more.

Mass., Winchester — Town, H. W. Stevens, relocating water tower at South reservoir. $25,000-$30,000.

Mass., Walpole—Town, Bd. Selectmen, waterworks improvements, incl. standpipe. $15,000 or more.

Minn., Minneapolis—City, rein.-con., reservoir in southwest section. $2,180,000. Work will probably be done by day labor. N. W. Elsberg, city engr.

N. H., Wilton—Town, Bd. Selectmen, water supply, from Stockwell Brook. To exceed $15,000.

N. J., Haledon—Bd. Boro Council, Boro Hall, filtering plant at Haledon reservoir. $120,000. Project in abeyance. Noted Feb. 12.

N. J., Spring Lake—Bd. Boro Council, Boro Hall, 32,000 lin.ft. 6- to 10-in. mains. $100,000.

O., Lorain—Installing 2 electrically driven auxiliary pumps, erecting 1,250,000 gal. storage tank in southern section city, and continuation 24 in. Reid Ave. water-main south to tank site. $250,000-$300,000. Noted Nov. 27.

Ont., Sault Ste Marie — City obtaining its water supply from wells instead of as at present, involving reconstruction of trunk watermain system, drilling wells, c.i. mains, etc. $25,000. A. H. Russell, City Hall, and James, Proctor & Redfern Ltd., 36 Toronto St., Toronto, engrs.

BIDS ASKED

Calif., Beverly Hills—Apr. 7, by City Council, furnishing, installing deep well turbine pump.

Calif., Los Angeles—See "Contracts Awarded."

Mass., Attleboro—See "Contracts Awarded."

Mich., Detroit—Mar. 31, by D. C. Grobbell, acting secy., Dpt. Water Supply, superstructure structural steel, brick, stone, screen chamber, 74 ft. square and 47 ft. high, at Water Works Park. G. H. Fenkell, 735 Randolph St., genl. mgr.

Mich., Detroit—Mar. 31, by D. C. Grobbel, acting secy., 735 Randolph St., furnishing 5 vacuum feed chlorinators of 0 to 300 lb. per day feeding capacity; piping and dosing grids; 4 full automatic springless weighing scales with graphic recording instruments, electric drive monorail trolley and 2 ton capacity, electric hoist. G. H. Fenkell, genl. mgr., 735 Randolph St.

Minn., Duluth — Mar. 30, by E. W. Kelly, engr., City Hall, water purification basin at Lakewood Pumping Station. $100,000. Noted Dec. 25.

Mont., Great Falls—Apr. 3, by City, waterworks improvements, incl. pumping plant $225,000. C. P. Wells, city engr. Black & Veatch, Mutual Bldg., Kansas City, Mo., engrs.

N. J., Barnegat—Apr. 6, by Mayor and Boro Council, School House, installing water supply. H. C. Shinn Municipal Bldg. Lakewood Boro. engr.; adv. E. N.-R. Mar. 26.

N. Y. Brooklyn—Mar. 31, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, new booster pumping station, incl. building, automatic pumping station, tank compressors, flanged pipe, fittings, bell and spigot pipe, discharge piping and appurtenances, in East New York Pipe Yard.

N. Y., New York—Mar. 31, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., mains in Thwaites Pl., Boston and Gun Hill Rds., East 231st and East 236th Sts., Bryant, Bussing, East Van Courtland, Grace, Halpern, Leland, Longfellow, Pittman, Richardson, Spofford, Taylor, Thieriot, Tiemann, Van Nest, Wallace, Watson, and Westchester Aves.

Pa., Pittsburgh—Apr. 1, by J. F. Malone, secy. Dpt. Properties & Supplies, Harrisburg, steel water tank, riser at State Penitentiary, for Commonwealth of Pennsylvania.

R. I., Barrington—Bristol & Warren Waterworks Co., bids about Apr. 1, distribution system. Supervising Engineers, Inc., 42 Cedar St., New York, engrs. Noted Feb. 12.

Wash., Seattle—Bd. P. Wks., bids about Mar. 27 West Seattle Reservoir, 75 m.g. capacity, founds. for 2 steel standpipes. $700,000. R. H. Thomson, city engr. Noted Feb. 12.

CONTRACTS AWARDED

Calif., Los Angeles—City Council, chlorination plant treating 5 m.g.p.d., mixing chamber sedimentation station, filter beds and wash water reservoir for City Water & Power Dpt. own forces. $100,000.

Calif., Sacramento—City, J. Dean, city mgr., elevating and screening equipment for filtration plant, to Link-Belt Co., 400 Paul Ave., San Francisco, $1,392. Noted Feb. 5.

Kan., Topeka—City Council, pumping equipment and pipe lines for clear water storage reservoir, to Kirkham & Kilmer, Pembroke Latte, $40,103; constructing Sewer 77, incl. 918 ft. 24 and 27 in. sewers, to Ramsey & Carter, Topeka, $8,940.

Mass., Attleboro—City, water piping, drains etc. in Emory and Pine Sts., day labor. $25,000. J. O. Taber, Jr., supt. P. Wks.

Mich., Detroit—Dpt. Water Supply, brick, concrete steel addition to East Side Pumping Station, Waterworks Park, to Brow-Stanley Co., 2411 14th St. $15,975.

Neb., Hastings — City, mains, to Midstate Constr. Co., Hastings, $25,912. Noted Feb. 19.

N. Y., Brooklyn—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Albany and Clarkson aves., to J. Deliso, 9839 Old South Rd., Ozone Park, $6,147. Noted Mar. 12.

N. Y., Long Island City—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in 47th Ave., to B. Costanzo, 115-14 117th St., Richmond Hill, $5,770. Noted Mar. 12.

N. Y., Massapequa—Bd. Water Comrs. Massapequa Water Dist., 331 Merrick Rd., new water works, to Karlson & Reed, West Barclay St., Hicksville. Noted Feb. 12.

N. D., Wahpeton—City, drilling wells to McCarthy Well Co., 670 Eustis St., St. Paul, Minn. Noted Feb. 26.

Tenn., Nashville—S. H. McKay, city clk., Feb. 24, furnishing motor driven pumping unit for high lift station, to Burford, Hall & Smith, Red Rock Bldg., Atlanta, Ga., $3,244. Noted Feb. 19.

Wash., Seattle — Mains in 1st Ave., L. L. Coluccio, 1642 Lane St., $55,501. Noted Mar. 6.

Wash., Seattle—Water Dist. 38, 8 mi. 1- to 6- pipe, to Argentieri & Colorassi, 1819 Weller St., $38,162, est. $40,000, Water Dist. 35, 3.5 mi. 2- to 6-in. mains, to A. Del Guzzo, c/o Miller Eng. Co., engrs., Burke Bldg., $18,247. Noted Mar. 23 Daily.

Wis., Grafton—City, waterworks and sewerage system, to J. M. Donahue, Stevens Point. $80,000.

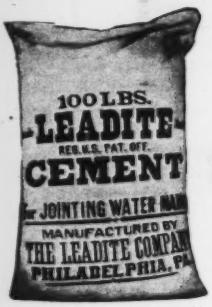
Wis., Milwaukee—Mains in West State St., to Wenzel & Henoch Constr. Co., 5025 State St., Milwaukee, $16,152.

Wis., Whitefish Bay—Village Clerk, in North Richard St., to Kehrein Bros., 750 17th St., $10,611; Class C meters ,to Badger Meter Mfg. Co., 841 30th St. $458; 705 tons Class C water pipe to Glomorgan Co., Milwaukee, $28,421; hydrants, to M. and H. Valve & Fdry Co., $406; eighteen 8- to 16-in. valves, to Municipal Fdry. Co., West Allis, $978. Grand total $40,874. Noted Feb. 12.

See proposal advertising on page 98

Constr. News page 123

LEADITE



It may cost a little more...

but—

—the difference in "first cost," when figured in terms of per mile of bell and spigot pipe laid—"IS INSIGNIFICANT," (as most Water Works Men, Engineers and Contractors well know).

Considering that Water Mains are laid—then backfilled and "forgotten"—it obviously stands to reason that the JOINTING MATERIAL USED should be one that has withstood the test of time, under all sorts of conditions—else the great expense of digging up streets and repairing unsatisfactory joints might occur.

We make no super-claims for LEADITE—but rather, prefer to have it judged solely on what it has done for years (and is now doing).

Thousands of miles of Bell and Spigot Pipe, in every civilized portion of the Globe are JOINTED WITH LEADITE—that's the very best reason we can give you for specifying LEADITE on your next job.

It isn't FIRST COST that counts—but rather what follows.

The Pioneer self-caulking material for c. i. pipe.
Tested and used for over 30 years.
Saves at least 75%

THE LEADITE COMPANY
Land Title Building - - - Philadelphia, Pa.

No Caulking

SEWERS

PROPOSED WORK

Calif., Burbank — Complete new sewerage system to provide modern type system with outfall into Victory Blvd. line. H. I. Stites, city engr.

Calif., San Francisco—Bd. P. Wks., City Hall, A. Hester, secy., incl. 65 lin.ft. 7 ft. circular and 220 lin.ft. 5 ft. x 5 ft. 6 in. rein.-con. outfall sewer into San Francisco Bay at Baker and Pierce Sts. M. M. O'Shaughnessy, city engr.

Conn., Meriden—Surveys sewerage system. To exceed $25,000. McClintock Co., Penna. Bldg., Phila., Pa., engrs.

Mass., Belmont—Town Bd. Selectmen, storm drains. $47,000 appropriated.

Mass., Belmont—Town Bd., Selectmen, sanitary sewer improvements, extensions. $48,000 appropriated.

Mass., Marblehead—Town, sewers. $35,000. F. Barbour, 1119 Tremont Bldg., Boston, engrs. Noted Feb. 19.

Mass., Natick—Town, Bd. Selectmen, sewerage and drainage in connection with construction new streets. $96,700 appropriated.

Mass., North Attleboro—Town, Bd. Selectmen, sewerage works. $26,500 appropriated.

Mass., Walpole—Town, Sewer Dpt., sewerage system in East Walpole Sect. $150,000 appropriated. A. F. Hart, Town Hall, town engr. E. Worthington, 4 Pearl St., Dedham, consult. engr.

Mass., Weymouth — Town sewerage system. $300,000. Metcalf & Eddy, Statler Bldg., Boston, consult. engrs.

Mich., Birmingham—Village, 28- to 48-in. covered drain or sewer, concrete and pipe construction. $150,000. H. H. Corson, village engr.

Minn., Marshall—City rejected bids Mar. 6, rock filter plant for sewage disposal plant. Noted Feb. 19.

N. J., Westwood—Bd. Boro Council, Boro Hall, furnishing, installing chlorination outfit at Sewage Disposal Plant. $5,000. T. F. Bowe, 110 William St., New York, engr.

O., East Cleveland (br. Celveland)—Sewers. $42,000. M. Garnett, City Hall, engr.

Pa., Erie—City, H. L. Munger, dir. Streets, bids in Spring storm sewers in 34th St. and Lake Side, culverts on West Lake Rd., Shaw Ave. and Fairmount Parkway. $34,000. A. N. Aiken, City Hall, engr.

R. I., Providence—Sewerage works in Peckham Ave., Jastram, Walton and North Main Sts. $25,000 or more. J. F. McCaffrey, chn. Sewer Comn.

Tex., Dallas—City, c/o E. Goforth, secy., rejected bids Mar. 11, storm sewers, Dallas branch, incl. Pacific Ave., $700,000, Peaks Branch $450,000, Mill Creek, $350,000. J. M. Young, Dallas, engr. Noted Mar. 5.

Tex., Dumas—Sanitary sewerage system, election Apr. 7, $70,000, for same. F. W. Hourn, Dumas, engr.

Tex., Galveston — City, c/o J. E. Pearce mayor, storm sewers East End Flat and Avenue S½, 41st to 47th Sts. and in 47th St. to Avenue P. $55.000. W. N. McGarvey, city engr.

Ont., Brantford—City, 8 in. up, vitr. tile in earth trench storm sewers in 15 streets, $50,000. F. P. Adams, City Hall, engr. Work will probably be done by day labor.

BIDS ASKED

Md., Baltimore—Apr. 1 by Bd. Awards, sanitary sewers in Sanitary Contr. 264, incl. 7,000 cu.yd. excav., 6,610 lin-ft. 8 in. and 21 in. diam. vitr. pipe sewer, 6,154 lin.-ft. 6 and 8 in. underdrain, 165 vert. ft. standard manholes. M. J. Ruark, Municipal Bldg., sewerage engr.

Mass., Boston—Mar. 30, by Dpt. P. Wks., sewerage works in Boston Proper; Apr. 2, in South Boston. $25,000. J. A. Rourke, Dpt. P. Wks., comr.

Mich., Ypsilanti—April 2, by G. R. Thompson, budget dir, Michigan Dpt. Health, 607 State Office Bldg., Lansing, sewage treatment works, incl. 11,000 cu.yd. excav., 1,435 cu.yd. concrete, 4,350 cu.yd. filter stone, at State Hospital. $30,000. E. D. Rich, State Office Bldg., Lansing, dir. Dpt. P. Health.

Wis., Monroe—Apr. 1, by W. Dunwiddie, city clk., sewage disposal plant, incl. aeration settling and digesting tanks, motor driven agitators, to treat 350,000 gal. sewage per day. L. Kessler, Williams Bay, engr.

N. J., Burlington—Apr. 7, by Mayor and City Council, sewage disposal plant in West Burlington. $150,000. B. Sleeper, city engr. Boardman & Probasco, Phila., Pa., engrs.

N. Y., Long Island City—Mar. 30, by G. U. Harvey, pres. Queens Boro. Queens Subway Bldg., sewers in Cross Island, Baisley and Springfield Blvds., Quencer, Sullivan, 119th Rds., Ely, 95th, 97th, 99th, 104th, 109th, Aves., Himrod, 169th, Brisbin, 148th, 1207th, and Newburg Sts.

N. Y., St. George—Apr. 1, by J. A. Lynch, pres. Richmond Boro, Boro Hall, sewers in Liberty Ave.; placing cinders on dirt roadway Clawson St. from Lincoln Ave. to New Dorp Lane.

Pa., Phila.—Apr. 8, by Dpt. P .Wks., Bureau Eng. & Surveys, City Hall Annex, A. Murdock, dir., Schedule A, branch sewers in State Rd. Stenton Ave., Amber, Annsbury, Penhurst, Bridge, Erdick, Franklin, Norris, 7th, 20th, Walnut, Wissinoming and Woodstock Sts.; Schedule B, main sewer Frankford Branch Philadelphia & Reading R.R. right-of-way between Bingham St. and Whitaker Ave.; Schedule C, sewage disposal project, intercepting sewer, Bristol St., from Belgrade St. to Lower Frankford Creek; Schedule D, structural steel for University Ave. Bridge under Pennsylvania R.R.; Schedule E, grading B St., between Erie and Venango Sts.

CONTRACTS AWARDED

Ill., Chicago—J. J. Sullivan, clk. Sanitary Dist. of Chicago, 910 South Michigan Ave., West Side Sewage Treatment Works, Div. CC, to Robert Gordon, Inc., 22 West Austin Ave., $190,923. Noted Mar. 5.

Ill., Fox River Grove—Village, sewage treatment plant, to Nick Santucci, Niles Center, $41,903; 8- to 15-in. vitr. tile sewers, to J. Brogan & Sons, Green Bay, Wis., $67,238. Noted July 26, 1928.

Ind., Hammond—Empire Oil & Refining Plant, sewers, sewage disposal plant eradicating oil wastes from sewage before discharged into Grand Calumet River, to A. C. Proudfoot Constr. Co., Hammond. Est. $53,000.

Ky., Louisville—Commissioners of Sewerage, 400 M. E. Taylor Bldg., Deep Park Sewer Contr., 53, 3,628 lin.ft. 33, 36, 39 and 42 in. plain or rein.-con. circular concrete sewer (3,672 ft. in open trench, 956 lin.ft. in rock tunnel) junction chamber, transitions, manholes, incl. 20,000 lb. reinforcing steel bars, to J. J. Quinn Co., 2425 Lexington Rd. $78,027. Noted Mar. 5.

Md., Baltimore—Bd. Awards, 42,710 lin.ft. 8, 12, 15 and 18 in. terra cotta sewer and 10,275 lin.ft. 6 in. terra cotta house connections in Leeds, Arbutus, and Ridgewood Sts., to N. Martell, 4400 Vesta Ave., for Bd. Comrs. Baltimore Co., Court House, Towson. $41,122. Noted Feb. 19.

Md., Baltimore—Bd. Awards, vitr. sanitary sewers, house connections, in Sanitary Contr. 268, to Marino Contg. Co., 305 North Exeter St., $16,112. Noted Feb. 26.

Minn., Marshall—Sewage disposal plant, to T. Jenson, St. Cloud, $17,250. Est. $19,000. Noted Feb. 19.

Neb., Grand Island—Sewage disposal plant, to Chambers Constr. Co., 701 1st Natl. Bank Bldg., Lincoln, $125,000. Est. $130,000. Noted Feb. 2.

Neb., Omaha—To Humphreys Bros., Omaha, sewers in 31st St., Sewer Dist. 1038 $2,695, rest., Sewer Dist. 1039, $372, 36th St. Sewer Dist., $1,040, $1,389, to H. J. Petersen Co., 607 Merchants Natl. Bank, Mud Creek Excavation, Storm sewer 1099, $570; to Omaha Sewer Constr. Co., Omaha, 56th to Sprague St., to 69th and Evans Sts., main sewer 1089, $15,408, to Beltz Constr. Co., Omaha, Mud Creek, storm sewer 1022, $25,675, in Davenport St., storm sewer 1085, $1,767. Grand total, $47,876.

N. Y., Brooklyn—M. Cosgrove comr. Docks, Pier "A", Battery Pl., New York, sewage disposal system, at Municipal Airport (Floyd Bennett Field), to Rosoff Bros., 1014 Gates Ave., $79,800; plumbing, to T. F. Mulligan, 48-28 11th St., Long Island City, $25,333; heating, to J. E. Brown, Inc., $11,328; electrical work, to J. P. Morrissey, 17 East 42nd St., New York, $90,899. Grand total $216,360. Noted Mar. 5.

N. Y., Buffalo—G. Fisk, comr. P. Wks., Municipal Bldg., sewer in Hertel Ave., to Montrose Constr. Co., 18-7 Hertel Ave., $52,000. Noted Feb. 5.

N. Y., New Rochelle—Westchester Co. Sanitary Sewer Comn., Court House Annex, White Plains, constructing Sect. Y, Mamaroneck Project, to E. Salvatore, 390 High St., Orange, N. J., $84,094. Noted Feb. 19.

N. Y., New York—W. J. Flynn, acting pres., Bronx Boro, Crotona Park, 3rd and Tremont Aves., sewer in Balcom Ave., to Anita Constr. Co., 410 200th St., $138,770. Noted Mar. 5.

N. Y., Rochester—City, sewers, concrete paving Cheltenham, Wyndham, Holcroft, Falleson and Burley Rds., to Whitemore, Rauber & Vicinus, 51 Griffith St., $77,150.

Pa., Phila.—Dpt. P. Wks., Bureau Eng. & Surveys, City Hall Annex, A. Murdock, dir., Schedule A, main sewer in Bells Mill Rd., between Wissahickon Ave. and Perkiomen Turnpike, to M. J. Driscoll, 100 Apsley St., $34,688. Noted Feb. 26.

Wis., Milwaukee—Dpt. P. Wks., to General Contractors, 4728 Lisbon Ave., sewers in allew west of North 37th St. $440, North Gordon Pl. $2,030; to J. Brogan & Son, 264 Prospect Ave., in East Bradley Ave., $14,385; to Zimmerman & Zimmerman, 2826 State St., in North 18th St., $7,105, South Pine Ave., $8,112, West Lisbon Ave. $11,529; to Werner Co., 728 8th Ave., Wauwatosa, North 54th St. $2,517, West Fiebrantz Ave., $533; to Teget Constr. Co., 3535 Villard Ave., North 31st St. $566, West Forest Home Ave., $1,361. Grand total $48,578. Noted Mar. 11 Daily.

WASTE DISPOSAL

PROPOSED WORK

N. J., Bloomfield—Bd. City Council, Municipal Bldg., municipal incinerator. $25,000 or more. **Maturity probably soon.**

N. J., Kearny—Bd. Town Council, municipal incinerator. $200,000. **Maturity probably soon.**

BIDS ASKED

N. Y., Brooklyn—Dpt. Hospitals, Municipal Bldg., New York, bids about July 1, incinerator, Coney Island Hospital. G. McCabe, 96 5th Ave., New York, archt.

Pa., Erie—Apr. 4, by City, City Hall, furnishing, erecting, installing incinerator equipment, incl. furnace combustion chamber, flumes, chimney, 125 ft. high, miscellaneous equipment.

BRIDGES

PROPOSED WORK

Ga., Augusta — Atlantic Coast Line Ry. and Charleston & Western Carolina Ry., c/o J. E. Willoughby, ch. engr. Atlantic Coast Line Ry., Wilmington, N. C., rein.-con. structural steel bridge over Savannah River. $600,000.

Ky., Owensboro—State Hy. Dpt., Frankfort, vehicular traffic toll bridge over Ohio River. H. R. Creal, c/o owner, bridge engr.

Me., Camden—Town, Bd. Selectmen, bridges, new roads, $34,700 appropriated.

Mass., Amesbury — Town, Bd. Selectmen, bridge, hy. improvements. $76,000 appropriated.

Mass., Amherst—Town, Bd. Selectmen, bridge, hy. improvements. $28,000 appropriated.

Mass., Andover—Town, Bd. Selectmen, new bridges, hys. and improvements. $65,000 appropriated.

Mass., Belmont — Town, Bd. Selectmen, bridges, hy. improvements. $79,600 appropriated.

Mass., Cohasset—Town, Bd. Selectmen, Fore River Bridge and hy. improvements. $41,000 appropriated.

Mass., Deerfield — Commonwealth of Massachusett and Town, plan concrete, steel bridge over Deerfield River. To exceed $25,000. Town votes $10,000 as its share of cost. A. W. Dean, Dpt. P. Wks., Boston, engr.

Mass., Dover—Town, Bd. Selectmen, bridges, hys. improvements. $26,400 appropriated.

Mass., Duxbury — Town, Bd. Selectmen, bridges, hys. and sidewalk improvements. $26,365 appropriated.

Mass., Fitchburg—City, Dpt. P. Wks., new bridges, hys. and improvements. $268,900 appropriated.

Mass., Foxboro — Town, Bd. Selectmen, bridges, hy. improvements. $35,600 appropriated.

Mass., Hudson—Town, Bd. Selectmen, 4 concrete bridges over Assabet River. $25,000 or more.

Mass., Hull—Town, Bd. Selectmen, bridge, hy. improvements, and new street. $63,500 appropriated.

Mass., Natick—Town, Bd. Selectmen, bridges, hys. improvements. $65,585 appropriated.

Mass., Needham—Town, Bd. Selectmen, bridge and hy. improvements. $27,000 appropriated.

Mass., North Attleboro—Town, Bd. Selectmen, bridges, hys. improvements. $76,300 appropriated.

Mass., Reading — Town, Bd. Selectmen, constructing new and improving old bridges, hys., sidewalks. $60,000 appropriated.

Mass., Saugus—Town Bd. Selectmen, bridges, hy. improvements. $116,000 appropriated.

Ont., Toronto—City, 300 ft. rein.-con. hy. bridge, on Lympstone Ave., at Lawrence Park. $66,350. R. C. Harris, City Hall, engr.

BIDS ASKED

California—Apr. 1, at office C. H. Purcell, engr. State Hy. Comn., Sacramento, six 19 ft. timber spans, one 40 ft. steel span bridge on timber bents with concrete footings over Auburn Ravine, near Auburn, Placer Co.—four 35 ft. span rein.-con. girder bridge on concrete pile bents, abutments over Carnadero Creek, near Gilroy, also grading, concrete paving 0.35 mi. roadway, Santa Clara Co.—thirty-one 40 ft. and seven 20 ft. span steel stringer overhead crossing with rein.-con. deck on steel pile bents and steel frame bents on concrete footings, timber pile foundations over Atchison, Topeka & Santa Fe R.R.; also grading, concrete paving approaches, Merced Co.

Calif., San Francisco—Apr. 29 (extended date), by S. J. Hester, secy., Bd. P. Wks., City Hall, 140 ft. span single leaf bascule bridge over Islais Creek channel at 3rd St., 80 ft. wide, 103 ft. between fenders, 6 ft. sidewalks, 2 street railway tracks, belt r.r. track, also vehicular traffic. $400,000. M. M. O'Shaughnessy, city engr. Noted Feb. 26.

Ind., Elkhart—Apr. 6, by Indiana State Hy. Comn., Indianapolis, rein.-con. bridge over Elkhart River, Middlebury St. $70,000. B. Wise, Gashen, engr.

Ind., Goshen — Bd. Comrs. Elkhart Co. bids about Apr. 1, Middlebury Street Bridge, incl. 200 ft. steel girder span. $80,000. W. S. Moore, 210 Union Trust Bldg., South Bend, engr. Noted Feb. 26.

Iowa—Mar. 31, at office C. R. Jones, aud. State Hy. Comn., Ames, two 80 x 24 ft. span plate girder bridge with six 40 x 24 ft. I-beam approach spans, 80 x 20 ft. plate girder bridge and 90 x 24 ft. plate girder bridge both with concrete abutments, on Rd. 30, east of Wheatland, F.A.B. 147, Clinton Co.—90 x 20 ft. pony truss bridge with two 40 x 20 ft. I-beam approaches, 1 culvert, extension Rd. 169, north of Winterset, B-36, Madison Co.—100 x 20 ft. pony truss bridge with two 40 x 20 ft. I-beam approach spans, raising, widening 20 x 18 ft. concrete slab bridge, also culverts, extensions, Rd. 81 from Wellman south, B-543, Washington Co.—twin 10 x 5 ft. box culvert, Rd. 113 in Monticello, B-678, Jones Co.—62 culverts, extensions, Rd. 9 from Lansing to Waukon, B-677—17 culverts extensions, Rd. 9 from Waukon west, B-685, all Allamakee Co.—one 84 x 24 ft., and one 70 x 24 ft. span plate girder bridge with two 50 x 24 ft. approach spans over overhead railroad crossing, Rd. 55, X-661, Dubque Co.—one 37 x 24 ft. I-beam overhead railroad crossing with two 27 x 24 ft. approach spans, Rd.

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Bridges (Continued)

161, X-835, Washington Co.—6 culverts, extensions, Rd. 30, F.A.B. 328, Boone Co.

Ia., Clinton—Mar. 27, at office Auditor Clinton Co., 4 I-beam bridges, twelve 24 ft. span wooden bridges, four 16 ft. wooden bridges, 11 box culverts, extensions, re-erecting 60 ft. pony truss bridge, 110 x 16 ft. high truss bridge, raising I-beam bridge.

Kentucky—See "Streets and Roads."

Maine—Mar. 31, by State Hy. Dpt., Augusta, Upper Bridge, Dresden, steel superstructure, involving 108,000 lb. steel, and substructure and floor, 769 cu.yd. concrete and hard pine floor—Minister Brook Bridge, Oxford, 263 cu.yd. concrete—Baker Bridge, Oxford, 394 cu.yd. concrete—Barter Island Bridge, Boothbay, steel superstructure, 197,000 lb. steel, and substructure and floor, 400 cu.yd. concrete and 43,000 B.M. hard pine—McGurdy Pond Bridge, New Sharon and Chesterfield, 509 cu.yd. concrete — Austin Bridge, Bingham, 604 cu.yd. concrete — Androscoggin River Bridge, Mexico and Peru, 547 cu.yd. concrete and also removing existing structure—Montsweag Farm Bridge, Woolwich, 368 cu.yd. concrete.

Maryland—Apr. 7, by State Roads Dpt., G. C. Uhl, Baltimore, chn., steel girder bridge with road relocation, Contr. A-81-611 Allegany Co.: sidewalk to be built over existing bridge on Cottage Ave. over Baltimore & Ohio R.R., Brentwood, Contr. P-161-311, Prince George's Co.: adv. E. N.-R. Mar. 26.

Mass., Newbury—Mar. 27, by Comrs. Essex Co., Court House, Salem, reconstructing Plum Island Bridge, incl. new timber deck, bituminous macadam surfacing and draw span, $25,000. Address Comrs. Essex Co.

Michigan—Mar. 31, by J. T. Sharpensteen, Escanaba, div. engr., F.A.Br.2 of 17-10-5, Contrs. 1 and 3, 2 timber abutments, rolled steel beams, 2 in. on plank on cross-ties, flooring, asphalt plant surface, Chippewa Co., for State Hy. Comn., Lansing.

Michigan—Apr. 1, by A. L. Burridge, div. engr., Cadillac F. A. Br. 1 of 4-8-1, Contrs. 2 and 3, 2 rein.-con. abutments, steel deck girder, rein.-con. flooring, Alpena Co., for State Hy. Comn., Lansing.

Michigan — Apr. 2, by C. A. Miller, div. bridge engr., Saginaw, F. A. Br. 1 of 77-22-1, Contrs. 3 and 4, 2 rein.-con. abutments, steel deck girder, concrete flooring, and F. A. Br. 1 of 77-8-1, Contrs. 2 and 3, 2 rein.-con. abutments, steel deck girder, rein.-con. flooring, both St. Clair Co., for State Hy. Comn., Lansing.

Miss., Holly Springs—See "Streets and Roads."

Missouri—Apr. 4, by State Hy. Bd., Jefferson City, bridges in Crawford, Dade, DeKalb, Dunklin, Gascanade, Grundy, Madison, New Madrid, Osage, Ralls, Ripley, Shelby, and Texas Counties. T. Cutler, ch. engr.

N. H., Milford—See "Contracts Awarded."

New Jersey—Apr. 6, by State Hy. Comn., Trenton, furnishing, erecting structural steel, Route 25, Connecting Link, Sect. 4-A, Contr. 46, Kearney, Hudson Co.—constructing roadway embankment, Route 25, Connecting Link, Sect. 8, Contr. 48, Newark, Essex Co.—embankment on Route 1, Sect. 5-South, Contr. 41, West Side Park, Jersey City, Hudson Co. A. L. Grover, ch. clk.: adv. E.N.-R. Mar. 26.

N. J., Red Bank—Apr. 8, by Bd. Freeholders Monmouth Co., Court House, Freehold, 50 ft. concrete, steel bridge over railroad extension of Shrewsbury Ave. to Eatontown Hy., $25,000 or more. G. K. Allen, 60 Broad St., Red Bank, engr. Noted Feb. 19.

Texas—Mar. 31, by G. Gilchrist, state hy. engr., Austin, 2 concrete girder bridges, concrete pile bents and abutments, one 6 span, 28 ft. 6 in. and other 10 span 28 ft. 6 in. with 22 ft. roadway, State Project 903-I. Hy. 99, Upton Co., $30,000.

Texas—Mar. 31, by G. Gilchrist, state hy. engr., Austin, rein.-con. bridges on Hy. 5, Federal Aid Project, 549-D, Gainesville Co. $46,000.

Tex., Dallas—Apr. 2, by Dallas Co., c/o C. Gross, repairing, reconstructing Oak Cliff Viaduct, incl. new lighting system, gunite walk, new sidewalks, bannisters. $113,000. R. H. Clinger Co., Dallas, engrs.

West Virginia—See "Streets and Roads."

Wis., Rhinelander—Apr 3, by State Hy. and Oneida Co. Hy. Comns., Davenport Street Bridge, on U. S. Hy. 8, S.A.P. 7857.

B. C., Prince George—Mar. 31, by R. W. Brahn, minister P. Wks., timber bridge to have one 140 ft., two 150 ft. and one 160 ft. Howe 2 strusses on concrete piers with trestle approaches over Nechako River, for Provincial Govt., Victoria, $75,000. P. Philip, Dpt. P. Wks., Victoria, engr.

CONTRACTS AWARDED

California—C. H. Purcell, engr. State Hy. Comn., Sacramento, three 27 ft. span rein.-con. girder bridge on concrete pipe bents with 100 ft. clear roadway over San Francisquito Creek, at Palo Alto, Santa Clara and San Mateo Counties, to Barrett & Hilp, 918 Harrison St., San Francisco, $17,218: one 100 ft. span rein.-con. arch bridge over Gaviota Creek, Santa Barbara Co., to P. M. White, Santa Monica, $36,278. Noted Feb. 19.

Calif., San Francisco—Golden Gate Bridge & Highway Dist., Alexander Bldg., additional borings on San Francisco side to determine location of piers, to Healy-Tibbits Constr. Co., 64 Pine St., $52,000. Noted Dec. 18.

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Illinois—State Dpt. P. Wks. & Buildings, Div. Hys., Springfield, bridges in Union Co., to International Steel & Iron Co., 1321 Edgar St., Evansville, Ind., $9,660—Route 48, Sects. 114-B and 115-B Ford Co., to Zimmerly Bridge Co., Paris, $16,023 and $32,677 respectively—Route 85, Sect. 102-B, Mercer Co., to P. McGlone, Harrisonville, Mo., $19,366—Route 85, Sect. 102-C Mercer Co., to Continental Bridge Co., 53 West Jackson Blvd., Chicago, $6,264—Logan Co., to G. B. Richardson, Hillsboro, $11,168—DeKalb Co., to Federal Bridge Co., 101 B. T. Bldg., Des Moines, Ia., $26,755—Hancock Co., to H. C. Holmes, Macomb, $7,587. Grand total $129,500. Noted Feb. 19.

Kentucky—State Hy. Comn., Frankfort, rein.-con. substructure for bridge over Clarks River, McCracken Co., to Koss Constr. Co., 2818 5th Ave., Des Moines, Ia., $42,518; two 126 ft., one 160 ft. span and one 60 ft. span steel superstructure with concrete flooring for above bridge to Vincennes Bridge Co., Vincennes, Ind., $40,047. Noted Jan. 22.

Minnesota—State Hy. Dpt., St. Paul, Bridge 5035, on S.P. 7-31-1, near Lamberton, Redwood Co. to Des Moines Steel Constr. Co., 421 Southwest 4th St., Des Moines, Ia., $25,002—Bridge 5045 on S.P. 12-33, Granite Falls, to Wausau Iron Wks., Wausau, Wis., $49,400—Bridge 4936, S.P. 18-23-3, at Princeton, Mille Lacs Co., to McKenzie-Hague Co., 422 Corn Exch. Bldg., Minneapolis, $42,555—Bridge 5014, S.P. 59-27-1, to Bland Eng. Co., 459 Harding St. N.E., Minneapolis, $39,000. Grand total $155,975. Noted Feb. 19.

Mo., Boonville—Missouri, Kansas Texas R.R. Co., Railway Exch., St. Louis, superstructure oridge over Missouri River, to American Bridge Co., 506 Olive St., St. Louis. Noted Jan. 22.

N. H., Milford—Town and State Hy. Dpt., Concord, widening Stone Bridge, two 50 ft. spans, day labor. $24,000. Noted Feb. 26.

O., Cleveland—City, 2 foot bridges, 2 span, 150 ft., steel, concrete for approaches to Lakefront Stadium, 40 and 60 ft. spans, to Dawson & Finan Co., Marion Bldg., 1276 West 3rd St., $252,000. Noted Mar. 5.

Pa., Phila.—Dpt. P. Wks., Bureau Eng. & Surveys, City Hall Annex, Schedule B, foundations for bridge under Pennsylvania R.R. at University Ave., to G. F. Dobbin, 1020 South 47th St., $57,506.

Pa., Pittsburgh—R. G. Woodside, controller Allegheny Co., south approach masonry (incl. upstream extension Saw Mill River Culvert) West End-North Side Bridge over Ohio River, to S. T. Brotemarkle, 2219 Brownsville Rd., $80,088. Noted Mar. 5.

Pa., Turtle Creek (br. East Pittsburgh)—Allegheny Co., test borings for bridge at Thompsons Run, near here, to Sprague & Henwood, Chamber of Commerce Bldg., Pittsburgh, $289. Total est. bridge $44,500. V. V. Covell, 519 Smithfield St., Pittsburgh, engr.

Rhode Island—State Roads Dpt., Providence, Bridge 25, Usquepaug River Bridge, Richmond and South Kingston, to Thomas Mulcare, Inc., 66 Western Ave., Boston, Mass., $11,979—Bridge 107, Union Village Bridge, North Smithfield, to McLean & Young, Providence, $15,350—Bridge 31 Federal Aid Project 46G, Washington R.R. bridge, Coventry, to F. Christy, 303 Chapman St., Providence, $17,576. Grand total $44,905. Noted Feb. 19.

Virginia—State Hy. Dpt., Richmond, bridges in Nansemond Co., to Roanoke Bridge Co., Roanoke, $30,123—on Spotsylvania Co., to Boatwright Russell & Linton, Manassas, $7,789—gravel surfacing road in Rockbridge Co., to Hall & Mitchell, Keswick, $12,160. Grand total $50,072. Noted Feb. 19.

Wash., Seattle—City, Bd. P. Wks., Bell St. Bridge, to General Constr. Co., Colman Bldg., $34,499. Est. $40,000. Noted Feb. 11 Daily.

Wis., Kaukana—State Hy. Comn. and Outagamie Co. Hy. Com. Green Bay, Lawe St. Bridge, 500 ft. long, 36 ft. roadway, two 6 ft. sidewalks over Fox River, to C. R. Meyer & Sons Co., Oshkosh, $207,826. Noted Mar. 5.

Wis., Watertown—Concrete bridge over Rock River, to Cunningham Bros., Beloit, $33,981.

STREETS AND ROADS

BIDS ASKED

Alabama—Apr. 7, by L. G. Smith, hy. dir., Montgomery, concrete, bitulithic concrete or sheet and rock asphalt paving 14.882 mi. Federal Aid Project 226, Escambia Co.

California—Apr. 1, by C. H. Purcell, engr. State Hy. Dpt., Sacramento, bituminous macadam surfacing 6.5 mi. road, grading, crusher run base surfacing 3.5 mi. same road between Waterman Switch-back and Saratoga Gap, Santa Cruz Co.—grading, concrete surfacing 3.7 mi. Wigmore-Los Alamos Rd., Santa Barbara Co.—1.5 mi. road at Bostonia, San Diego Co.

California—Apr. 8, by State Hy. Comn., Sacramento, grading 5 mi. road between point 4 mi. north La Canada and Colby Canyon, Los Angeles Co.—14.2 mi. road between point 2 mi. west of Bridgeport and Sonora Junction, Mono Co.—concrete surfacing 3 mi. Burlingame-San Mateo Rd.—crushed rock and screenings to be stock piled on 6.6 mi. road between Rancho San Mateo and Half Moon Bay Rd., both San Mateo Co.—grading, concrete surfacing 1.1 mi. at Lytton Overhead Crossing, Sonoma Co.

Calif., Eureka—Bd. Supervs. Humboldt Co., bids about Apr. 14, emulsified asphalt surfacing 14 mi. roads. F. E. Kelly, Eureka, co. surv.

Calif., Los Angeles—Apr. 1, by Bd. P. Wks., City Hall, 9,210 lin.ft. cement house connections, 1,168 lin.ft. vitr. clay house connec- sewers, resurfacing 114th St. and Monitor Avnue Sewer Dist.

Calif., Nevada City—Apr. 6, by R. N. M Cormack, clk. Nevada Co., improving 9.94 Grass Valley-Bear River Rd., 5.1 acres clearin 34,800 cu.yd. excav., 8,370 tons crushed r base, 5,250 cu.yd. crushed rock (salvaged 3,558 tons broken stone (bituminous macada surface), 289 tons emulsified asphalt, corr gated culverts. J. F. O'Connor, Nevada Cit engr.

Colorado—Mar. 31, by State Hy. Dpt., Denver (**F.A.P. means Federal Aid Project**) gradin concrete surfacing 4.097 mi. Manzanola-Rock Ford Hy., State Hy. 6, F.A.P. 272-F, Otero C —grading, gravel surfacing 8.37 mi. State H 8 east of Watkins, F.A.P. 149-D, Div. 1, Adam and Arapahoe Counties—grading 8.422 mi. Hudley-La Junta Hy., State Hy .6, F.A.P. 245-Otero Co. C. D. Vail, hy. engr.

Florida—Mar. 31, by State Road Dpt., Tallahassee, clearing, grubbing, grading, drainage structures, concrete paving 8.7 mi. Road 4, Federal Aid Project 60-C, Volusia Co. B. M. Duncan, state hy. engr.

Idaho—Apr. 2, by A. Harbour, comr. P Wks., Boise, crushed graveling 12.877 mi. Oregon Trail Rd. from Neeleys Corner to F.A.P 108-A Power Co.: 5.109 mi. North and South Hy. between Craigmont and Lawyers Canyon Lewis Co.

Ind., Anderson—Apr. 6, by Bd. Comrs., Madison Co., concrete surfacing Dale J. Noland Rd $176,215. W. O. Shatterly, Anderson, aud.

Ind., Anderson—Apr. 6, by Auditor Madison Co., grading, filling culverts, concrete surfacing 11 mi. Carr Elwood Rd., 18 ft. $176,000. P Phipps, Anderson, engr.

Ind., Cannelton—Apr. 6, by Bd. Comrs. Perry Co., gravel surfacing E. Badger Rd. $28,203 P. L. Arnold, Cannelton, aud.

Ind., Princeton—Apr. 7, by Bd. Comrs. Gibson Co., concrete surfacing J. Loveless Rd $22,119—William Clift Rd., $15,017—Hugh Smith Rd., $8,637. S. G. Marshall, Princeton aud.

Ind., Warsaw—Apr. 7, by Bd. Comrs. Kosciusko Co., concrete surfacing 2.6 mi. H. Robinson Rd. H. B. Helvey, Warsaw, aud.

Iowa—Mar. 31, at office C. R. Jones, aud State Hy. Comn., Ames, grading, drainage structures, paving 14.448 mi. U. S. Rd. 71 from Buena Vista Co. line towards Spencer, P.-256 Clay Co.—1.786 mi. Rd. 11 in West Union P-553, Fayette Co.—18.132 mi. Rd. 9 from Kossuth Co. line through Thompson from Forest City, P-750AC, Winnebago Co.

Ia., Guthrie Center—Apr. 2, at office Auditor Guthrie Co., 80,000 cu.yd. excav. on local and trunk roads. A. McKeel, Guthrie Center, co. engr.

Ia., Marquette—See "Contracts Awarded."

Ia., Montezuma—Mar. 31, at office Auditor Poweshiek Co., grading, incidental work 22.64 mi. trunk and local roads, 5.8 mi. blade grader or casting work, also 20 items rein.-con. culverts, 85 bbl. lubricating oils, 5,000 lin.ft. culvert pipe.

Ia., Montezuma — Apr. 7, at office Auditor Poweshiek Co., crushed stone or gravel surfacing 24 mi. trunk roads, 11 mi. local roads.

Ia., Sioux City—Apr. 10 (extended date) 5 in. concrete or asphalt paving 5,000 sq.yd. Hamilton St. from 16th to 19th Sts. $11,713—3,000 sq.yd. South Leonard St. from Horne to West 1st Sts. $7,102—880 sq.yd. 8th St. from Iowa to Wall Sts. $1,865—2,700 sq.yd. 3rd Ave. from South Paxton to South Cecelia Sts. and South Cecelia St. from 3rd to 4th Aves. $6,316—3,000 sq.yd. 34th St. from Nebraska St. to Perry Creek Rd. $8,162—2,500 sq.yd. 30th St. from Douglas to Summit Sts. $5,856—4,500 sq.yd. 5 alleys $8,772. J. M. McLean, City Hall, engr. Noted Mar. 5.

Ia., Waterloo—Mar. 30, at office Auditor Black Hawk Co., grading 17.75 mi. local and trunk roads, 10 rein.-con. box culverts, 22 culvert extensions.

La., Bastrop—Apr. 7, by Police Jury Morehouse Parish, improving 2 mi. roads in Project 6—3.5 mi. Project 7—1 mi. Project 8. J. L. White, Court House, engr.

Maine—Mar. 31, by State Hy. Dpt., Augusta, gravel surfacing 3.47 mi. hy., Danforth—4.51 mi. Charleston—7.78 mi. Connor and Cyr—2.05 mi. Perry—1.9 mi. Baileyville—grading and base on 5.7 mi. hy., Woolwich and Wiscasset—concrete surfacing 1 mi. hy., Fort Kent—2.05 mi. Bar Harbor—0.63 mi. Dover and Foxcroft—bituminous macadam paving 5.51 mi. Caribou—bituminous macadam paving 2.17 mi. Bar Harbor.

Maryland—Mar. 31, by State Roads Comn., G. C. Uhl, chn., Baltimore, concrete shoulders on 7.29 mi. Federal Aid Project 227-B, Contr. F-173-611, Frederick Co.—macadam resurfacing 2.28 mi. Contr. H-112-42, Harford Co.—gravel surfacing 6.55 mi. Federal Aid Project 220, Contr. SM-78-84, St. Mary's Co.; adv. E. N.-R. Mar. 26.

Mass., Rockland—See "Contracts Awarded."

Mass., Woburn—See "Contracts Awarded."

Michigan—Apr. 8, at Office City Clerk, Muskegon Heights, grading, shaping, drainage structures, concrete paving 1.889 mi. F061-10C-3, Muskegon Co., for State Hy. Comn., Lansing.

Mich., Flint—Mar. 31, by Genesee Road Comn., shaping, drainage structures, gravel surfacing 125 mi. roads, 12 ft.; shaping, drainage, structures, concrete paving 124 mi. roads, 20 ft. J. H. Dennis, Flint, co. engr.

Streets and Roads (Continued)

Minnesota—Apr. 7, by State Hy. Dpt., 1246 **University** Ave., St. Paul, concrete paving 13.7 mi. S. P. 3-42, Divs. B and C—14 mi. S.P. 9-23, Divs. A and D, F.A.P. 224—5.5 mi. S.P. 9-23, Div. C same road—12.7 mi. S.P. 10-32, F.A.P. 211—16.5 mi. S.P. 14-24 Sect. 4, Div. A, road A.P. 406-G, S.P. 14-24, Sect. 4, Div. B, F.A.P. 406-B, S.P. 14-24, Sect. 4, Div. C, S.P. 14-24, Sect. 3, F.A.P. 355-C, and S.P. 14-24, Sect. 2, Div. A—6.6 mi. S.P. 20-35, Sect. 3—grading 15.1 mi. S.P. 4-47—8.7 mi. S.P. 18-23, Sect. B —11.5 mi. S.P. 46-21—11.5 mi. S.P. 1-45, Sect. 1—9.8 mi. S.P. 14-26, Sect. 1.

Mississippi—Apr. 3, by State Hy. Comn., Jackson **(F.A.P. means Federal Aid Project)** bridges, culverts, grading, drainage structures 5.395 mi. Tupela-Baldwin Rd., F.A.P. 215-A, Lee Co., incl. 125,812 lb. reinforcing and 120,300 lb. structural steel, 3.7 mi. Bermuda sodding, 2,112 lin. ft. found. piling—3.12 mi. Hattiesburg-Gulfport Rd., F.A.P. 73-E, Stone Co. incl. 24,950 lb. reinforcing steel 1.27 mi. Bermuda sodding—0.626 mi. Jackson-Florence Rd., F.A.P. 162, Reopened, Rankin Co., incl. 6,988 lb. reinforcing steel, 0.6 mi. Bermuda sodding—4.116 mi. Forest-Raleigh Rd., F.A.P. 203-B, Smith Co. —incl. 25,325 lb. reinforcing steel, 1.24 mi. Bermuda sodding—5.392 mi. Natchez-Selma Rd., F.A.P. 216-A, Adams Co., incl. 217,370 lb. reinforcing and 409,050 lb. structural steel, 2.36 mi. Bermuda sodding, 2,772 lin.ft. found. piling, 8,061 lin.ft. creosoted piling, 137,375 b.m. creosoted lumber—11.465 mi. Grenada-Memphis Rd., F.A.P. 55-3 and 4 Reopened Grenada Co. incl. 153.158 lb. reinforcing steel, 6.97 mi. Bermuda sodding. C. R. Williamson, dir.

Mississippi—Apr. 3, by State Hy. Comn., Jackson, concrete surfacing 13 mi. Meridian-Hattiesburg Rd., Lauderdale Co. C. R. Williamson, hy. engr.

Miss., Holly Springs—Apr. 7, by Bd. Supervs, Marshall Co., gravel surfacing 1.5 mi. Wall Hill-Byhalia Rd., Dist. 3, also Coen Mill Bridge, 150 ft. long, pile over Tippah River, Dist. 5. C. M. Williams, dir.

Missouri—Apr. 4, by State Hy. Bd., Jefferson City, improving roads in Andrew, Carroll, Crawford, Dade, DeKalb, Dent, Douglas, Dunklin, Gasconade, Grundy, Harrison, Howard, Lawrence, Madison, Monroe, Montgomery, New Madrid, Osage, Ralls, Ripley, Shelby, Texas, and Worth Counties. T. H. Cutler, state engr.

New Jersey—Apr. 6, by State Hy. Comn., Trenton, grading, 9 in. rein.-con. paving 44,188 sq.yd. and granite block on 6 in. concrete paving 10,460 sq.yd. Route 3, Sects. 1A and 2A, Hudson Co. A. L. Grover, ch. clk.; adv. E.N.-R.

N. J., Cliffside Park—Bd. Boro Council, Boro Hall, Mar. 16, grading, sheet asphalt on concrete paving Prospect, Rothwell and Riverview Aves., from Coppoletta Bros., Inc., 452 Palisade Ave., $38,690. Noted Mar. 12.

N. J., Mountain Lakes—Apr. 7, by Mayor and Boro Council, Boro Hall, curbing, drains, culverts, sidewalks, bituminous penetration, paving 22,770 sq.yd. Lake Dr.-Midvale Rd. Impvt. F. T. Rubidge, boro engr.

New Mexico—Apr. 2, by W. C. Davidson, state hy. engr., Santa Fe, grading, bridging 13.4 mi. F.A.P. 1-C. Reopened, between Colfax and Maxwell Junction, Colfax Co.—3.8 mi. F.A.P. 5, Tucumari to Montova, Quay Co.—6.6 mi. F.A.P. 14-A, Tesuque and Santa Fe, Santa Fe Co.—21.9 mi. Gallup and Guan, McKinley Co.—3.9 mi. F.A.P. 90, Santa Fe and Pecos, Santa Fe Co.—35 mi. F.A.P. 217-A, Quay Co.—3.1 mi. F.A.P. 143-E, between Las Cruces and Deming, Dona Ana Co.—9.8 mi. F.A.P. 157-A between Clayton and Texline, Union Co.—oil surfacing 18.4 mi. F.A.P. 157-C between Grenville and Des Moines.

New York—Apr. 14, by A. W. Brandt, comr. Hys., Albany, constructing roads in Albany and Greene, Nassau and Steuben Counties; reconstructing roads in Albany, Broome, Chautauqua, Chemung, Essex, Jefferson, Nassau, Niagara and Steuben Counties; adv. E. N.-R. Mar. 26.

N. Y., Buffalo—Apr. 9, by G. Fisk, comr. P. Wks., Municipal Bldg., repaving street railway area in Perry St.—Milburn St.—paving Duluth, Campbell, Fitzgerald, and Kenmore Ave. W. Rathman, city engr.

N. Y., Long Beach—Mar. 31, by City Council, City Hall, grading, curbing, paving streets, highways, boulevards; adv. E. N.-R. Mar. 26.

O., Cleveland—Apr. 1, by City, improving Carnegie Ave., from East 14th to East 19th Sts., Fulton Rd. from Bush Ave. to Denison Ave. and East 85th St., from Tioga to Connecticut Aves. $100,000. R. Hoffman, City Hall, city engr.

Oregon—Apr. 2, by State Hy. Dpt., Salem, grading 8 mi. hy., Lane Co.—2 mi. Tillamook Co.—paving 4 mi. Rock Creek Hy.—1 mi. Multnomah Co.; resurfacing 12 mi. Wasco Co., 7.8 mi. Umatilla Co.—oiling 34 mi. Union Co.—42 mi. Lane Co.—bridges at Cope Creek, Lane Co. —Malheur River, Malheur Co.—Salmon River, Tillamook Co. R. Klein, state engr.

Pennsylvania—Apr. 9, by State Hy. Dpt., Harrisburg, improving 25 mi. 7 projects in Allegheny, Armstrong, Blair, Chester, Lancaster, Lycoming, Tioga, Bradford, Northumberland, and Wyoming Counties. S. S. Lewis, secy.; adv. E. N.-R. Mar. 26.

Pa., Phila.—Apr. 7, by Bureau Hys., Dpt. P. Wks., City Hall Annex, A. Murdock, dir., Schedule A, grading, improving Cottman Ave., from New York Short line of Reading R.R. to Elm Ave.—Schedule B, asphalt paving (assessment work) Ashdale St. from railroad to Front St., C St. from Ontario to Tioga Sts., Ditman St. from McMenamy to Hartel Sts., Duncannon St. from Maschner to Front Sts., G St. from Venango to Erie Sts., and from Huntington Park to Annsbury St., Knorr St. from Roosevelt Blvd. to Brous St., Saul St. from Bridge to Brill Sts., Wayne St. from Arbutus to Carpenter Sts., 12th St. from Spencer to summit south of Champlost Sts.—Schedule C, asphalt repaving Chew St. from Mt. Airy to Mt. Pleasant Sts., Christian St. from 9th to 12th Sts.—Schedule D, redressed granite block repaving Susquehanna St. from 2nd to 3rd Sts.—Schedule E, country road improving Bean St. from Shawmont to Minerva Sts., Eva St. from Shawmont to Dearnley Sts., Minerva St. from Eva to Bean Sts.—Schedule F, hire of 24 ton motor trucks for meadow bank work—Schedule G, furnishing, delivering oil for mosquito elimination—Schedule H, furnishing, delivering lumber—Schedule I, furnishing, delivering structural steel (warehouse stock)—Schedule J, repairing compressor-Schedule K, furnishing, delivering 75 bbl. Portland cement—Schedule L, furnishing, delivering 200 tons grout, sand—Schedule M, furnishing, delivering 100 tons gravel—Schedule N, furnishing, delivering 10,000 hard sewer brick.

Rhode Island—Apr. 1, by State Bd. P. Roads, Providence, **(F.A.P. means Federal Aid Project)**, rein.-con. paving 8 mi. hy. North Kingstown, Exeter and South Kingston, Emergency F.A.P. 65-A, Contr. 3102—3 mi. hy. East Providence, Emergency F.A.P. 71-A, Contr. 3105—pre-mixed bituminous concrete on plain concrete paving hy., West Warwick, Emergency F.A.P. 77-A, Contr. 3109; adv. E. N.-R. Mar. 26.

Texas—Mar. 31, by G. Gilchrist, state hy. engr., Austin, **(F. A. P. means Federal Aid Project and S. P. State Aid Project)**, grading, drainage structures 11.304 mi. Hy. 5, F.A.P. 549-D, Unit 1, Cooke Co., $70,000—12.785 mi. Hy. 18, F.A.P. 446-B, Unit 1, Motley Co., $72,000—15.395 mi. Hy. 51, S.A.P. 446-C, Haskell Co., $44,000, all foregoing 26 ft. wide—triple asphalt on caliche base course surfacing 7.67 mi. Hy. 137, S.A.P. 936-B, Unit 2, Ector Co., $110,000—rein.-con. paving, 10,606 mi. Hy. 15, F.A.P. 526-A, B, and C, Unit 2, Kaufman and Dallas Counties, $260,000—3.736 mi. Hy. 6, S.A.P. 778-C and F.A.P. 535-C and D, Waller Co., $240,000—6.484 mi. Hy. 114, S.A.P. 839-G and H, Unit 2, Dallas Co., $220,000, all foregoing 18 ft. wide.

Vermont—Mar. 27, by Hy. Dpt., Montpelier, concrete paving 17.5 mi. hy. Rutland, Pittsfield and Brandon.

Virginia—State Hy. Dpt., Richmond, rescinded contract clearing, grubbing, grading, drainage structures, one course guacalam surfacing 1.378 mi. roads in Augusta Co. Will probably lengthen road project by reducing width. Noted Mar. 19, under "Contracts Awarded."

Washington — Apr. 7, by S. J. Humes, dir. Hys., Olympia, concrete paving 5.9 mi. State Rd. 1, Oak Rd. to Beverly Park, Unit 2 of Emergency F. A. P. 119-A, Snohomish Co.

West Virginia—Apr. 7, by State Road Comn., Charleston, grading, drainage structures 1.13 mi. Follansbee-Fairy Glen Rd., Project 175-B Brooke Co.—1.3 mi. Ceredo-Huntington Rd., Project 186-B Wayne Co.—concrete surfacing 2.3 mi. Poplar Springs-Pennsylvania State Line Rd., Project 188-A Marshall Co.—3.81 mi. Blacksville-Bula Rd., Project 172-A Monongalia Co. —4.08 mi. Wadestown-Burton Rd., Projects 172-C and D Monongalia and Wetzel Counties—2 mi. Kimball-Bottom Creek Rd., Projects 2048-C and B and 2049-B McDowell Co.—traffic bound stone or slag bottom course surfacing 4.7 mi. Hurricane-Mount Vernon Rd., Project 3311 Putnam Co.—surface treatment on stone surfacing 8 mi. Herndon-Mercer Co. Line Rd., Project 3245-A and B Wyoming Co.—grading, drainage structures 6 mi. Pike-Goose Creek Rd. Project 143-C—5.8 mi. Goose Creek-Nutter Farm Rd., Project 143-D, both Ritchie Co.—45,000 lin.-ft. wire rope guard rail between Welch and Maybeury, State Route 8, McDowell Co.—42,000 lin.-ft. wire rope guard rail between Spencer and Glenville, State Route 5, Roane, Calhoun and Gilmer Counties—Pughtown Bridge, 30 ft. concrete arch span, Project 181-B Hancock Co. —Laurel Bridge, 120 ft. and two 50 ft. spans —Oxbow Bridge, 200 ft. span, Beckner Bridge, 180 ft. span, steel superstructures over Hughes River, Project 3431 Ritchie Co. G. E. White, secy.

Ont., Pembroke—See "Contracts Awarded."
Ont., Perth—See "Contracts Awarded."
Ont., Toronto—See "Contracts Awarded."
Ont., Whitby—See "Contracts Awarded."

CONTRACTS AWARDED

California—C. H. Purcell, engr. State Hy. Comn., Sacramento, asphaltic concrete surfacing 9.8 mi. road between point 1.5 mi. south of Santa Margarita and Atascadero, San Luis Obispo Co., to Hanrahan Co., Standard Oil Bldg., San Francisco, $209,700.

Calif., Los Angeles—Bd. P. Wks., City Hall, curbing, sidewalks, concrete paving Marmont Ave. and Woodhill Trail Impvt. Dist., to J. A. Thompson, Financial Center Bldg., $35,630.

Delaware—State Hy. Dpt., Dover, clearing, grubbing, grading, concrete paving 16.34 mi. Georgetown-Milford, duPont Rd., widening Contr. 173, to Walter Roach & Sons, Georgetown, $133,875—4.96 mi. Millsboro-Bryans Store, Contr. 174, to Old Line Constr. Co., Chestertown, Md., non-metal $101,338—0.87 mi. 43rd St. cut-off Wilmington, Contr. 183, to George & Lynch, Dover, pre-mix $65,775—clearing, grubbing 4.7 mi. Bryans Store-Hardscrabble, Contr. 187, to W. W. Truitt, Lincoln City, $8,550—1,500 rods woven wire fence, 25 intermediate and end posts, 10 corner posts and 10 gates on 4.91 mi. St. Georges-Drawyers, Contr. 169-F, to Boyce Bros., Stanton, $2,329—1,300 rods woven wire fence, 36 intermediate and end posts, 12 corner posts, 12 gates, on 4.31 mi. Fieldsboro-Drawyers, Contr. 182-F, to Geo. M. D. Hart & Sons, Townsend, $2,193—steel superstructure Marshallton Bridge Contr. 144, to G. E. Shockly, Rehoboth, $19,661. Grand total, $333,721. Noted Feb. 19.

Florida—State Roads Dpt., Tallahassee, 8 in. Florida limerock base on 12.13 mi. Madison Co., to Manley Constr. Co., Leesburg, $122,656—4.59 mi. St. Johns Co., to F. K. Webb & Associates, $54,523—clearing, grubbing, grading, drainage structures, 8 in. compacted Florida limerock base with surface treating 1.9 mi. Gadsden Co., to John E. Ballinger Constr. Co., Greenville, S. C., $28,276. Grand total: $205,449.

Illinois—State Dpt. Wks. & Buildings, Div. Hys., Springfield, to W. F. Smith Co., St. Louis, Mo., paving roads in Mason and Cass Counties $54,192—to M. J. Davidson, 706 Chestnut St., St. Louis, Mo., Cass Co. $101,271—to W. A. Black Co., 165 West Wacker Dr., Chicago, Ford Co. $130,533—to McMahon Constr. Co., Rochester, Inc., Ford Co. $113,262—to P. Simmons, Quincy, Schuyler Co. $82,100—to Cameron-Joyce & Co., 170 South 8th St., Keokuk, Ia., Mason and Logan Counties $88,289; Logan Co., $71,674; Route 96, Sect. 124 $140,811—Route 96; Sect. 125, $170,679; both Hancock Co.—to Graham-King Constr. Co., 550 South Cedar St., Galesburg, Knox Co. $10,979—to Central Eng. Co., 809 Putnam Bldg., Davenport, Ia., Mercer Co. $110,073; Route 3, Sect. 7W $18,016; Route 3, Sect. 7W-1 $41,885, both Rock Island Co. $41,885, to M. Hayes & Sons, 209 South La Salle St., Chicago, grading, drainage structures roads in Mercer Co. $51,306. Grand total $1,185,070. Noted Feb. 19.

Ill., Edwardsville—Bd. Comrs, Madison Co., grading, concrete surfacing 5.4 mi. New Douglas-Livingston Rd., to Tri-City Paving Co., Granite City, $159,760.

Ill., Peoria—Bd. Local Impvts., City Hall, J. M. Barton, pres., asphalt resurfacing 7,094 lin.ft. Adams St. S., 60 ft., to Bauer-Johnson Co., 1314 South Adams St., $34,693.

Indiana—State Hy. Comn., Indianapolis, grading, drainage structures, concrete paving 81,224 sq.yd. Spencer-Bloomington Rd., Monroe Co., to H. A. Carpenter, Brazil, $138,352. Est. $157,347. Noted Jan. 8.

Ia., Marquette—City Council, 6 in. concrete paving 9,000 sq.yd., to F. Carlson Co., Decorah, $16,605; soon takes new bids concrete paving 17,000 sq.yd. residential streets. W. E. Buell & Co., 337 Insurance Exch. Bldg., Sioux City, engrs.

Kan., Kansas City—Bd. Comrs, Wyandotte Co., bituminous macadam surfacing 0.24 mi. Holcomb Rd., 14 ft., to Roberts Bros., 86 South 18th St., $32,026.

Maryland—State Roads Comn., Baltimore, G. C. Uhl, chn., concrete paving 1.91 mi. Contr. D-69-14, Dorchester Co., to Layfield & Waller Paving Co., Salisbury, $25,723. Noted Feb. 5.

Maryland—State Roads Comn., Baltimore, G. C. Uhl, chn., penetration macadam paving 1.07 mi. Contr. P-154-32, Prince George's Co., to M. J. Grove Lime Co., Lime Kiln, $17,066. Noted Feb. 12.

Maryland—State Roads Comn., Baltimore, G. C. Uhl, chn., concrete paving 1 mi. Contr. Wo-98-14, Worcester Co., to Hanneman-Burroughs Co., Salisbury, $20,844. Noted Mar. 5.

Maryland—State Roads Comn., G. C. Uhl, chn., Baltimore, concrete paving 2 mi. Contr. Wi-63-12, Wicomico Co., to P. D. Phillip & Bro., Salisbury, $27,419. Noted Feb. 19.

Massachusetts—Metropolitan Dist. Comn., 20 Somerset St., Boston, E. B. Rogers, dir. park engr., resurfacing roadway on Charles River Dam, Boston and Cambridge, to Coleman Bros. Co., Inc., 245 State St., Boston, $54,619.

Mass., Rockland—Town, Bd. Selectmen, constructing various streets, day labor. $30,000.

Mass., Woburn—City, Dpt. P. Wks., gravel and bituminous macadam paving Middle and Bedford Sts., day labor. $28,000. H. V. Mackey, Dpt. P. Wks., supt.

Michigan—A. L. Burridge, div. engr., Cadillac, drainage structures, shaping 10.786 mi. FO6-12, Contr. 2, Arenac Co., to W. T. Hill, East Tawas, for State Hy. Comn., Lansing, $68,624 incl. cement. Noted Feb. 19.

Michigan—At office J. T. Sharpensteen, div. engr., Escanaba, shaping, concrete paving 8.069 mi. FO55-Contr. 2, Menominee Co., to C. G. Bridges, Escanaba, for State Hy. Comn., Lansing, $174,367 incl. cement. Noted Feb. 26.

Michigan—J. T. Sharpensteen, div. engr., Escanaba, shaping, concrete paving 3.291 mi. FO21-9-Contr. 3, Delta Co., to C. G. Bridges, Escanaba, for State Hy. Comn., Lansing, $70,452 incl. cement. Noted Feb. 26.

Michigan—At office Village Clerk Clinton, grading, shaping, drainage structures, concrete paving 5.068 mi. M046-18, Contr. 1, to J. A. Mercier Co., 450 West Fort St., Detroit, for State Hy. Comn., Lansing. $118,862 incl. cement. Noted Feb. 5.

Mich., Allegan — Allegan Co. Road Comn., grading drainage structures, Class B gravel surfacing 10.6764 mi. Covert Rd. Assessment Dist. 16, 9 and 16 ft., to Brown Bros., Battle Creek, $55,014.

Minnesota—State Hy. Dpt., St. Paul, to Interstate Contg. Co., 754 Vandalia St., St. Paul, paving 10.4 mi. S.P. 7045, Sect. 2, F.A.P. 62 and S.P. 7045, Sect. 3, F.A.P. 290-B, $177,544—to Western Asphalt Paving Corp., 2100 East 4th St., Sioux City, Ia., 13 mi. S.P. 9-40, Sect. 1, F.A.P. 398, $216,091—to Central States Constr. Co., Crosby, 9 mi. S.P. 9-33, $172,470; 311.125 sq.yd. S.P. 9-48, S.P. 9-38, and S.P. 9-33, F.A.P. 311-A, $333,979—to Woodrich Constr. Co., 411 Hodgson Bldg., Minneapolis.

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Streets and Roads (Continued)

0.7 mi. S.P. 18-21, F.A.P. 217, and 0.6 mi. S.P. 18-23, Sect. 1, $149,099—to C. F. Scully Equipment Co., 212 Dakota Bldg., St. Paul, 11.3 mi. S.P. 20-35, Sect. 2, S.P. 20-35, Sect. 1 and S.P. 20-32 $197,033; 4.9 mi. S.P. 20-24, $93,903—to C. W. McNamara, 6-8 North Walts Ave., Sioux Falls, S. D., grading 16.3 mi. S.P. 7-31, Sect. 2, and S.P. 7-39, Sect. 3, $71,760; 14.9 mi. S.P. 9-30, Sect. 1, $76,776; 11.9 mi. S.P. 32-38, $42,539; S.P. 32-35, $42,699;—to R. P. England, Mitchell, S. D., 5.4 mi. S.P. 17-26, $25,987; 15.8 mi. S.P. 53-21, $175,286. Grand total $1,775,166. Noted Feb. 19.

Mississippi—State Hy. Comn., Jackson, grading, bridges on 0.7 mi. road, Warren Co., to Wooten & Tucker, Memphis, Tenn., $75,579—5.148 mi, Panola Co., to F. V. Ragsdale, Dermon Bldg., Memphis, Tenn., $136,044—2.156 mi. Panola Co., to M. Harvey, Oxford, $30.135. Grand total $241,758.

Mississippi—State Hy. Comn., Jackson, to Shuptrine Constr. Co., Canton, clearing, grubbing, culverts, bridges, sodding, markers, grading 2.045 mi. roads in Hinds and Copiah Counties $10,497; 10.282 mi. Forest Co. $75,593—to Clark & McCaa, Jackson, 6.674 mi. Forest Co. $64,030; 13.046 mi. Coahoma Co. $63,-835; 6.156 mi. Rankin Co. $35,125—to W. F. Watts & Co., Collins, 5.559 mi. Covington Co. $43,592—to Cobb Bros., Meridian, paving 3.508 mi. Alcorn Co. $71,210—to W. R. Stricklin, Meehan, bridges in Alcorn Co. $12,273. Grand total $376,155. Noted Mar. 5.

N. J., Glen Rock—Bd. Boro Council, Municipal Bldg., grading bituminous macadam paving Boulevard Extension, to Sowerbutt Quarries, Prospect Park, $13,573—sidewalks, curbs, to J. DiBrigida & Son, Inc., 65 Hudson St., Hackensack, $6,050—sewers, to P. Guiliani, 447 North Main St., Lodi, $8,967. Grand total $28,590. Est. $30,000.

New York—A. W. Brandt, comr. Hys., Albany, to Lowell, Grossman & Co., State Rd., Poughkeepsie, grading 0.437 mi. Delaware Co. $12,-232 est. $17,954; concrete paving 6.02 mi. Westchester Co. $406,598 est. $516,532—to J. F. Morgan Co., Olean, 1.45 mi. Schuyler Co. $64,-657 est. $84,149—to E. H. Duke, Wellsville, 0.12 mi. Allegany Co. $7,224 est. $8,494—to W. J. Gallagher, Medina, 3.94 mi. Monroe Co., $173,679 est. $223,345; 4.38 mi. Genesee Co., $151,771 est. $191,512—to C. D. Murray, Syracuse, 2.69 mi. Cortland Co., $99,784 est. $118,-214—to Fitzgerald Bros. Constr. Co., Inc., Troy, 9.86 mi. Rensalaer Co., $375,836 est. $539,-704—to Hogeboom & Canfield, Inc., Utica, 6.34 mi. Oneida Co. $254,129 est. $328,634; 4.8 mi. Oneida Co. $176,586 est. $224,917—to Cold Spring Constr. Co., Akron, 5.81 mi. Steuben and Livingston Counties $211,131 est. $285,372—to J. Bellardino, Seneca Falls, 4.07 mi. Cayuga and Onondaga Counties $149,715 est. $194,374—to J. Thompson, Carthage, 9.98 mi. Oswego Co., $346,705 est. $437,690—to Camarco Constr. Co., Inc., Ossining, 5.12 mi. Dutchess Co. $274,157 est. $354,123—to J. F. Paddelford, Sherburne, 2.43 mi. Madison and Oneida Counties, $135,495 est. $158,621—to C. Hansen, Troy, 4.76 mi. Oneida Co., $234,678 est. $298,744—to Liberto & Corullo, Inc., Depew, 7.62 mi. Montgomery Co., $311,837 est. $403,359; 17.07 mi. Chautauqua Co. $370,554 est. $470,726; 4.62 mi. Oswego and Onondaga Counties, $183,261 est. $224,410—to D. W. Brown Co., Inc., Kenmore, 2.3 mi. Niagara Co. $67,799 est. $86,289—to W. L. Collins, Hornell, 1.54 mi. Allegany Co., $76,451 est. $93,347—to Schnellman, Inc., Schuyler Lake, grading, structures, 6.38 mi. Onondaga Co. $230,831 est. $303,906—to Munroe & Westcott, Inc., Attleboro, Mass., 0.33 mi. Nassau Co., $203,301, est. $323,616—to J. Arborio, Poughkeepsie, 0.14 mi. Westchester Co., $230,116 est. $206,935—to R. E. Weber, Schenectady, 7.24 mi. Warren Co. $396,236 est. $440,982—to Harp & Conway Constr. Corp., Kingston, 4.37 mi. Orange Co. $396,146 est. $503,817; to D. Deering Co., Norwalk Conn., 5.67 mi. Dutchess Co., $325,254 est. $427,704—to Mayer Bros. Constr. Co., Erie, Pa., bituminous macadam paving 5.94 mi. Cortland Co., $200,144 est. $276,152—to L. Longhi & Son, Torrington, Conn., 5.71 mi. Washington Co., $173,920 est. $224,570—to J. Walker, Mayfield, 1.32 mi. Albany Co. $54,616 est. $68,-957—to Sweeney & Boland, 39 State St., Rochester, 3.87 mi. Cortland Co., $223,610 est. $295,-367—to Rochester Concrete Constr. Co., 466 Clinton Ave. S., Rochester, 6.74 mi. Oneida Co., $374,820 est. $407,267—to Binghamton Constr. Co., Binghamton, 7.76 mi. Ostego Co. $264,-738 est. $359,05?. Grand total $7,158,011. Noted Jan. 29, Feb. 1 and 26.

N. Y., Long Island City—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., asphalt paving Newtown Rd., to Meehan Paving & Constr. Co., Laural Hill Blvd., $6,969—127th St., to Borough Asphalt Co., 1301 Metropolitan Ave., Brooklyn, $10,117—grading 82nd St., to Tully & DiNapoli, 30-11 Sherman St., $6,869 respectively—ramps on Boardwalk, Beach 24th St. to S. Casalino, 224 Beach 80th St., Belle Harbor, $5,388—widening Long Island R.R. Bridge, to Welsh Bros. Contg. Co., 35 Purvis St., $2,995—resurfacing Northern Blvd., to Carbloc Paving Co., Stagg St., Brooklyn, $114,-514. Grand total $146,852. Noted Feb. 19.

N. Y., New York—W. J. Flynn, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., to F. Gabrielle, 2750 Creston Ave., grading Buhre Ave., $3,818—to Venetian Contg. Co., East Bay Ave. and Tiffany St., Astor Ave. $1?,-220; asphalt paving Morrison Ave. $9,941; Stratford Ave. $19,123; Fetley Ave. $19,55?—to C. D. Beckwith, Inc., Seneca Ave. and Edgewater Rd., Marcy Pl., $3,930. Grand total $68,584. Noted Mar. 5.

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O., Akron—Summit Co., grading, drainage structures, traffic bound slag paving 2.8 mi. Red Hill Rd., 32 ft. roadway, 18 ft. improved, to T. L. Smith, 1958 Newton St., $21,044. Est. $31,200.

O., Miles Heights (br. Cleveland)—Village, to H. G. Herring, 1660 Wayside Rd., Cleveland, concrete paving Cowan Ave. $19,719, Langley Rd., $14,394 McRae Ave. $22,360, Gardner Ave. $20,884. Grand total, $77,357. Noted Feb. 12.

Ore., Canyon City—Grant Co., grading 9.16 mi. Hamilton Monument Rd., to J. A. Tertelling & Sons, Spokane, Wash., $49,600.

Pennsylvania—State Hy. Dpt., Harrisburg, concrete surfacing 3.27 mi. State Road, Route 376 between Pittsburgh and Clarton to new airport in Mifflin Twp., 30 and 40 ft. wide, Allegheny Co., to R. H. Cunningham & Sons Co., 125 Grant St., Turtle Creek, $425,521.

Rhode Island—State Bd. P. Roads, Providence, **(F.A.P. means Federal Aid Project)**, rein.-con. paving 1.6 mi. Emergency F.A.P. 74, Contr. 3107, Warwick, to Lane Constr. Corp., 134 State St., Meriden, Conn., $97,094—bituminous macadam paving 3.6 mi. Emergency F.A.P. 72-A, Contr. 3101, Little Compton, to Ricci & Ricci Excavating Co., 189 Pocasset Ave., Providence, $106,959—5.2 mi. Emergency F.A.P. 73-A, Contr. 3108, Westerly, to R. H. Newell Co., Uxbridge, Mass., $112,613. Grand total $316,666. Noted Mar. 5.

Tex., Austin—To L. E. Whitham & Co., 804 East 4th St., concrete paving 26,285 sq.yd. Chicon St., $63,627 est. $65,000; 16,742 sq.yd. East 7th St., $33,056 est. $35,000; 14,012 sq.yd. West Ave., Neches, Pease and West 30th Sts., $30,096 est. $35,000; 13,173 sq.yd. East 4th and Trinity Sts., $32,185 est. $35,000; 8,238 sq.yd. East 2nd, East 3rd and East 4th Sts., $25,569 est. $25,000—to Southwest Bitulithic Co., Box 266, Sta. A, San Antonio, bitulithic paving 15,740 sq.yd. Red River and Blanco Sts., $36,858 est. $35,000 — 23,388 sq.yd. Windsor, East and West 14th, Brazos and Colorado Sts., $57,799 est. $60,000; 16,195 sq.yd. San Antonio St., $37,243 est. $40,000; 21,932 sq.yd. West 21st, West 22nd, West 23rd, West 28th, East 32nd and Red River Sts., $50,577; 28,804 sq.yd. East Monroe St., Travis Heights Blvd. and River Side Dr., $69,493 est. $70,000. Grand total $436,503.

Tex., Fort Worth—Grading Meacham Field Airport to Dallas Constr. Co., 3106 Commerce St., Dallas, $119,000; constructing steel, rein.-con. underpass at South Main St., to H. K. McCollum, Fort Worth Natl. Bldg.; steel, to North Texas Iron & Steel Co., 1401 North Adams St.

Tex., Houston—City, asphalt on 6 in. concrete paving 2.4 mi. Lowell St. extension, to Brown & Root, Inc., 1904 Post-Dispatch Bldg., $86,909.

Virginia—State Hy. Comn., Richmond, grading, drainage structures 4.023 mi. Buena Vista-Lexington Rd., Project F-592-A, Rockbridge Co., to K. L. Black & Co., 1314 Grayland Ave., Richmond, $83,116. Former contract rescinded. Noted Jan. 29, under "Contracts Awarded."

Virginia—See "Bridges."

Wash., Mount Vernon—Comrs. Skagit Co., grading, grubbing, draining, surfacing 2 mi. Faber Hill Rd., Lateral Hy. 3, to Dorsey & Wilder, Inc., Bellingham, $44,997. Noted Mar. 6 Daily.

Wis., Milwaukee—Dpt. P. Wks., to N. Harris, 820 East Mason St., grading, paving alley between North 34th and 35th Sts., $417; alley between East Linns and East Conway Sts., $1,716; alley between North 37th and North 38th Sts., $668; alley between North 49th and North 50th Sts., $1,071; North 52nd St., $19,609; North 53rd St., $30,379; North 47th St., $9,781; North 68th St., $31,328; West Euclid Ave., $1,400; West Hale Pl., $3,784; West Melvania St., $2,839; South 40th St., $2,983. Grand total $105,975. Noted Mar. 6.

Wyoming—State Hy. Dpt., Cheyenne, grading, bridging 9.077 mi. Fremont Co., to Midland Constr. Co., Casper, $33,803—15.861 mi. Fremont Co., to List Constr. Co., 413 Railway Exch. Bldg., Kansas City, Mo., $87,944—8.449 mi. Johnson Co., to Watt Bros., Buffalo, $37,483—9.177 mi. Campbell Co., to Stanley Bros., St. Cloud, Minn., $53,766—6.717 mi. Park Co., to Taggart Constr. Co., Cody, $25,607—18.566 mi. Natrona Co., to J. J. Dooling, 1026 17th St., Denver, Colo., $61,703—bituminous macadam paving 0.854 mi. F. A. P. 120D, to Woodward Constr. Co., Rock Springs, $25,046 — oil processing roads in Natrona Co., to R. H. Reed, Cheyenne, $33,627—on Sheridan Billings Rd. and Sheridan Buffalo Rd., to Western Bridge Constr. Co., 3857 Leavenworth St., Omaha, Neb., $104,375—3 bridges in Johnson Co., to Omaha Steel Wks., 609 South 44th St., Omaha, Neb., $89,671. Grand total $553,025. Conditional award bridge in Park Co., to C. M. Smith, Thermopolis, $40,833. Noted Mar. 12.

Wyoming—State Hy. Comn., Cheyenne, surfacing 22.1 mi, Fremont Co., to F. B. Anderson, Casper, $11,340, est. $10,800—2.826 mi. Albany Co. and 6.794 mi. Sweetwater Co., to Reel Constr. Co., Sidney, Neb., $40,169 and $12,804 respectively; est., $48,595 and $23,199 respectively—grading, bridging 10.167 mi. Lincoln Co., to Hass-Doughty & Jones, Merchants Exch. Bldg., San Francisco, Calif., $54,112 est. $57,634—15.249 mi. Fremont Co., to R. A. Schwiegert Co., Billings, $21,331 es. $24,577—4.131 mi. Sheridan Co., to G. Barron, Sheridan, $25,964 es. $33,338—9.859 mi. Washakie Co., to Blanchard Bros., 1641 South Logan St., Denver, Colo., $51,092 est. $54,061—4.592 mi. Goshen Co., to Wyoming Constr. Co., Laramie, $21,750 est. $26,961. Grand total, $238,568. Noted Feb. 19.

Ont., Copperclife—Dpt. Northern Development, Parliament Bldgs., Toronto, rock crushing for 11 mi. hy. between Copperclife and Vermilion River, to Rautly Constr. Co., Ltd., 21 Dundas Sq. Est. $50,000—$60,000.

Ont., Kitchener—City concrete slab covering 1,500 ft. Schneiders Creek, to Dunker Constr. Co., 251 King St. W., $51,921.

Ont., Pembroke—Renfrew Co., maintenance of present roads, incl. grading, ditching, gravel and macadam paving, day labor under supervision W. J. Moore, Pembroke, engr., $35,350; plans construction, incl. gravel and paved roads, $70,346.

Ont., Perth—Lanark Co., new roads $23,000, road maintenance, incl. drainage structures, grading, culverts, graveling $50,000, day labor. W. Huber, Perth, engr.

Ont., Toronto — Toronto and York Roads Comn., 57 Adelaide St. E., maintenance suburban and county roads, $25,000 and $3,500 respectively, day labor; plans constructing new suburban and county roads $190,000 and $17,000 respectively. H. C. Rose, 57 Adelaide St. E., engr.

Ont., Whitby — Ontario Co., maintenance county roads during year, incl. grading, graveling, macadam paving, culverts, day labor under supervision of D. J. Kean, engr., County Bldg., $35,000; also plans new roads, $60,000.

EXCAVATION

PROPOSED WORK

Ia., Sioux City — Reynolds Creek Drainage Dist., drainage work. $20,000. Project in abeyance. E. L. Ferguson, 512 U. B. Bldg., Sioux City, engr. Noted Feb. 19.

La., Jennings—Jefferson Davis Parish Police Jury, C. R. Houssiere pres., 138 mi. drainage ditches, incl. 4,100,000 cu.yd. excav. $400,000. M. Bernard, Crowley, engr.

Mass., Nahant—Town, Bd. Selectmen, Town Hall, seawall, Marginal Rd. $25,000.

Mass., Winthrop—Metropolitan Dist. Comn., 20 Somerset St., Boston, rebuilding seawall, recently damaged by storm, and repaving Shore Dr. $500,000-$1,000,000.

Miss., Biloxi—City Council deepening Biloxi River to 12 ft. depth, constructing docks. $52,-000 voted. Government to match sum.

BIDS ASKED

Calif., Turlock—Apr. 6, by A. Sorensen, secy. Turlock Irrigation Dist., 29,400 ft. 2 in. concrete canal lining, 9 concrete structures, Impvt. Dist. 72; 705 lin.ft. 30 in. diam. concrete pipe, Impvt. Dist. 77; 14,490 sq.ft. 2 in. concrete canal lining, 6 concrete structures, Impvt. Dist. 65; 12,300 sq.ft. 2 in. canal lining, 6 concrete structures, Impvt. Dist. 70. R. V. Meikle, ch. engr. Noted Jan. 22.

Ill., Chicago—Apr. 10, by Bd. Comrs. Lincoln Park, North Clark and Center Sts., general fill for extension Lincoln Park between Kenesaw Terrace and Berwyn Ave.; constructing breakwater between Margate Terrace and Berwyn Ave.; dredging Montrose Harbor; constructing retaining wall for Montrose Harbor. L. Nettelhorst, comr.; adv. E. N.-R. Mar. 26.

Kan., Hutchinson—See "Contracts Awarded."

Louisiana—Mar. 31, by State Bd. of Engineers, New Orleans, Reid-Bedford Diversion Canal, 6,800 ft. long, 27,000 cu.yd. excav., Madison Parish; Grand Bend New Levee, 1,450 ft. long, 6.3 ft. high, 10,000 cu.yd. excav., Rapides Parish.

La., Natchitoches—Apr. 1, by Bd. Comrs. 19th La. Levee Dist., 500 ft. Alligator Bayou Dike on Red River left bank, rear East Point, Red River Parish, incl. 14,000 cu.yd. excav.; 5,300 ft. East Point New Levee Red River left bank, Red River Parish, 55,000 cu.yd. excav. State Board Engineers, New Orleans, engrs.

CONTRACTS AWARDED

Ind., Frankfort—Clinton Co., improving 4 mi. Perry Purcifull Drain, incl. 6,276 lin. ft. 12- to 20-in. tile, 58,480 cu.yd. dry earth excav., to G. Michael, Frankfort.

Ind., Fowler—Benton Co., Big Pine Creek Ditch, 7.3 long, to F. M. Horton, 53 West Jackson Blvd., Chicago, Ill.

Ind., Warsaw—Repairing, cleaning out Samuel D. Copes Ditch, incl. 57,749 cu.yd. excav., to D. E. and W. Alumbaugh, Sullivan.

Kan., Hutchinson—City Council, flood protection work on Cow Creek, incl. 33,000 cu.yd. excav., 21,000 sq.yd. dressing banks, day labor, under supervision A. W. Hefling, engr. $14,130. Noted Jan. 19.

Louisiana—Bd. Comrs. Gravity D. D. 2, Calcasieu and Jefferson Davis Parishes, dredging main and lateral canals, to J. P. Babcock, Paris, Ill., at $0.0557 per cu.yd., total, $84,000. Noted Mar. 5.

La., New Orleans—Bd. Comrs. Lake Borgne Basin Levee Dist., at office Bd. State Engineers, New Orleans Court Bldg., Jackson Levee, incl. 300,000 cu.yd. excav., St. Bernard Parish, to Wills Constr. Co., St. Louis, Mo., at $0.149 per cu.yd. Noted Feb. 19.

Okla., Medford—Pond Creek D. D. 1, Grant Co., drainage work, to Jones Constr. Co., Madison, Wis., $22,840. Est. $45,000. Noted Feb. 13, 1930.

Tex., Harlingen—A. Tamm, engr., 209½ West Jackson St. and Cameron Co. Water Impvt. Dist. 1, constructing 300,000 sq.ft. canal lining, to F. Brown, Brownsville, and J. Roberts, Harlingen, $30,000. Noted Feb. 19.

Tex., Port Aransas—Gail Borden Munsill Co., Port Aransas, 402 ft. oil unloading dock, 40 ft.

Excavation, Drainage, Irrigation, Levees (Cont.)

wide, concrete, timber, equipped with electrically driven pumps, 15,000 bbl. per hr. capacity, to W. Richardson, Port Aransas, $100,000. Noted Mar. 5.

Bond Elections

Coming Bond Elections

Pipe Line, Reservoir, Pumps—Freeburg, Ill., Apr. 21, $33,000.
Deep Wells, Tank on Tower Pumps, 7 mi. 2 to 10 in. Mains—Dallas Centre, Iowa, Apr. 15 or later, $66,000.
Waterwork Impvts.—Collyer, Kan., $24,250.
Waterworks Impvts.—Le Roy, Kan., Apr. 6, $36,000.
Sewage Impvts.—Huntsville, Ala., Apr. 21, $25,000.
Sanitary Sewage System—Dumas, Tex., Apr. 7, $70,000.
Power Distribution System—De Soto, Mo., Mar. 31, $95,000.
Enlarging Airport — Dallas, Tex., Apr. 7, $300,000.
Exposition—Oakland, Calif., $400,000.
Schools—Los Angeles, Calif., Mar. 27, $12,720,000.

Bonds Voted

Repairs to Filtration Plant, Etc.—Sacramento, Calif., $480,000.
Waterworks Distribution System—Altoona, Ia., $25,000.

Bonds Defeated

Reservoir—Hornell, N. Y., $70,000.
Reservoir—Price, Utah, $52,000.
Sewers—Joplin, Mo., $275,000.
High School—Los Banos, Calif., $175,000.

FEDERAL GOVERNMENT

PROPOSED WORK

D. C., Wash.—RIVER and HARBOR IMPROVEMENTS—Secretary of War, upon recommendation of Chief of Engineers has made allotment of funds for river and harbor improvements, $52,819,246.

D. C., Wash.—LIGHTHOUSES, etc.—Dpt. Commerce, Lighthouse Service, has been alloted $918,981 for constructing and improving aids to navigation in 28 states, Hawaii and Alaska.

Idaho, Boise—HOSPITAL—Vet. Bu., new infirmary, $250,000. Noted Dec. 25.

Ia., Davenport—POST OFFICE, etc.—Treas. Dpt. at office Sup. Archt., plans by S. J. Temple, Union Bank Bldg., post office and court house.

Me., Augusta—SEWER, etc.—U. S. Disbursing Officer, extension sewer and water system, $7,000.

Mass., Winthrop—POST OFFICE—Treas. Dpt. at office Sup. Archt., 1 story, basement, brick, stone, Metcalf Square, $60,000. Noted Sept. 25.

Mass., Winthrop — RADIO HOUSE — Treas. Dpt. at office Sup. Archt., soon take new bids 1 story, basement, 24 x 41 ft. radio house, at Fort Heath. Former bids rejected. E. Sanatangini, 408 Atlantic Ave., Boston, archt. Noted Mar. 19.

N. J., Newark—POST OFFICE—Treas. Dpt. at office Sup. Archt., plans by G. O. Totten, Jr. and W. E. Lehman, assoc. archts., 972 Broad St., post office and courthouse, $6,150,000.

Texas—FLOOD CONTROL — International Water Comn., Wash., D. C., ordered surveys, flood control works along Rio Grande River. W. E. Anderson, San Benito, engr.

BIDS ASKED

Ala., Montgomery—HOSPITAL—Apr. 23, by Con. Q.M., Maxwell Field, hospital and detachment barracks, fire station and guard house, post exchange; adv. E. N.-R. Mar. 26. Noted Jan. 29.

California—ROAD—U. S. Forest Serv., Ferry Bldg., San Francisco, taking bids grading, culverts on 6.6 mi. Santa Barbara Natl. Forest, Monterey Co.

California—ROAD—Apr. 2, by C. H. Sweetser, dist. engr. Pub. Rds., 461 Market St., San Francisco, grading, structures on 9.574 mi. Project 12-A, Howard Gulch Natl. Forest Hy., Modoc Co.

California—ROAD—Apr. 7, by C. H. Sweetser, dist. engr. Pub. Rds., 461 Market St., San Francisco, grading 3.085 mi. Sect. B, Big Trees-Dorrington Rd., Ebbetts Pass Natl. Forest Hy. Calaveras Co.

California—ROAD—Apr. 7, C. H. Sweetser, dist. engr. Pub. Rds., 461 Market St., San Francisco, grading 3.74 mi. Sect. B, Long Barn-Stoddard Springs, Sonora Pass Natl. Forest Hy., Tuolmne Co.

Colo., Montrose—POST OFFICE—Apr. 16, by Treas. Dpt. at office Sup. Archt., constructing U. S. Post Office.

D. C., Wash. — CABLE, etc. — Mar. 31, by Signal Supply Officer, Signal Sect., New York General Depot, Army Base, cable, cases, terminals, etc.

Florida—DREDGING—Apr. 3, by U. S. Eng., Jacksonville, 175,000 cu.yd. from Calooshatchee-Lake Okeechobee Canal between Sta. 144/50, near east end Lake Hicpochee and Lock 3, near Fort Thompson.

Ga., Fort Benning—QUARTERS—Apr. 7, at office Con. Q.M., 5 field officers and 51 company officers quarters; adv. E. N.-R. Mar. 26.

Kan., Fort Leavenworth—HOSPITAL—Apr. 9, by Con. Q.M., hospital ward. $75,000.

Me., Portland—COURT HOUSE—Apr. 17, by Treas. Dpt. at office Sup. Archt., extending, remodeling 2 story, basement, brick court house. $400,000. Noted Dec. 25.

Mass., Springfield—POWER PLANT—Commanding Officer, Springfield Armory, taking bids and opens same about Apr. 10, brick, steel, concrete steam boiler power plant, Hill Shops, $105,000.

Mass., Watertown — WATERWORKS — See "Contracts Awarded."

Mich. Sault Ste Marie — WAREHOUSE — Apr. 17, by U. S. Eng., Detroit, warehouse, St. Mary's Falls Canal; adv. E. N.-R. Mar. 26. Noted Feb. 26.

N. J., Fort Monmouth—ROADS—Apr. 16, at office Con. Q. M., roads, storm drains, walks, water lines, etc.; adv. E. N.-R. Mar. 19.

New York—DREDGING—Apr. 24, by U. S. Eng., 1st Dist., New York, 182,200 cu.yd. ledge rock in Hudson River, at Van Wies Point, 3.5 mi. south of Albany, and at Fitches Wharf, 22.5 mi. south of Albany; adv. E. N.-R. Mar. 26.

N. Y., Staten Island—POST OFFICE—Apr. 13, by Treas. Dpt. at office Sup. Archt., constructing (except elevators) U. S. Post Office; adv. E. N.-R. Mar. 19.

Oregon—ROAD—Apr. 2, by W. H. Lynch, ch. engr., Portland, grading Forestry Walk, Canyon City, Grant Co.

Ore., Portland—COURT HOUSE—Apr. 17, by Treas. Dpt. at office Sup. Archt., court house extension. Noted July 10.

R. I., West Warwick—POST OFFICE—Mar. 31, by Treas. Dpt. at office Sup. Archt., U. S. Post Office.

Tenn., Chattanooga—LODGE—Apr. 7, by Con. Q.M. lodge at Chattanooga Natl. Cemetery.

Tenn., Memphis — DRAGLINE MACHINE — Apr. 8, by U. S. Eng., 1 steam-operated bank grader dragline machine and supervising erection thereof on barges; adv. E. N.-R. Mar. 26. Noted Mar. 19.

Tex., Fort Sam Houston—QUARTERS—Apr. 6, by Con. Q.M., twelve 2 story, basement, noncommissioned officers quarters; adv. E.N-R. Mar. 26.

Vt., Rutland—POST OFFICE—Apr. 16, by Treas. Dpt. at office Sup. Archt., constructing U. S. Post Office, Court House, (except elevators); adv. E. N.-R. Mar. 26. Noted Nov. 20.

CONTRACTS AWARDED

Ala., Montgomery—MACHINE SHOP, etc.—Con. Q. M., machine shop, assembly building, warehouse, for Air Corps., to Batson-Cook Co., West Point, Ga., $61,500. Noted Jan. 29.

Calif., San Diego—CRANE TRACKS—Spec. 6443—P. Wks. Office, 11th Naval Dist., crane tracks at Naval Operating Base, to Merritt-Chapman & Scott, San Pedro, $30,500.

Colorado—ROAD—Pub. Rds., A. E. Palen, dist. engr., 301 Custom House, Denver, grading, draining 4 mi. Six Mile Creek Natl. Forest Rd., Pike Natl. Forest, Pike Co. to Platt Rogers, Inc., Pueblo, $64,945.

Conn., New Haven—DREDGING—U. S. Eng. Providence, R. I., 347,000 cu.yd. in Quinnipiac River, to Morris & Cummings Dredging Co., 44 Whitehall St., New York, $74,038. Noted Feb. 19.

La., New Orleans — LEVEE — U. S. Eng., Prytania St., 370,000 cu.yd. levee in Davis Dist. and 370,000 cu.yd. Fairfield Levee, both LaFourche Levee Dist., to Lower Coast Constr. Co. Ltd., Godchaux Bldg., $48,840 each; 340,000 cu.yd. in Bringol Levee, to Howard Kenyon Dredging Co., 3603 McKinley St., Houston, Tex., $45,900; 295,000 cu.yd. in Echo Levee and Riverside Boeuf Levee Dist., to McWilliams Dredging Co., Canal Bank Bldg., $35,105, both in Red River, Atchafalaya and Bayou Boeuf Levee Dist.; 375,000 cu.yd. Butler Levee, Pontchartrain Levee Dist., to Highway Constr. Co., Godchaux Bldg., $52,125. Grand total $230,810. Noted Feb. 26.

Mass., Springfield—ELEVATORS—Treas. Dpt. at office Sup. Archt., elevators for U. S. Post Office, to Otis Elevator Co., 810 18th St., Wash., D. C., $48,847. Noted Mar. 5.

Mass., Watertown—WATER SYSTEM—Con. Q.M. new water distribution system, at Watertown Arsenal, dry labor. $65,000. Noted Mar. 5.

N. J., Metuchen—HOSPITAL—Con. Q.M., 39 Whitehall St., New York, general contract 2 story, basement, brick, steel hospital, Raritan Arsenal, to Alliance Constr. Co., 1457 Bway., New York. Est. $150,000. Noted Jan. 29.

Okla., Frederick—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to Upchurch Constr. Co., Montgomery, Ala., $56,990. Noted Feb. 12.

Tex., Waco—HOSPITAL—Vet. Bu., Arlington Bldg., 4 story, 100x286 ft. main hospital building, to H. B. Ryan Co., 500 North Dearborn St., Chicago, Ill., $824,900; plumbing, heating and electrical work, to J. C. Korioth Co., Sherman, $332,100. Noted Jan. 22.

Virginia—LOCK GATES—U. S. Eng., Norfolk, tidal lock gates at Great Bridge, in Albermarle and Chesapeake Canal, to Merritt-Chapman & Scott, 17 Battery Pl., New York, $307,703. Noted Jan. 15.

Va., Fort Monroe—QUARTERS—Con. Q.M., 3-story, bachelor officers' quarters, brick veneer, rein.-con., to Townsend Lumber Co., Anderson, S. C., $120,000. Noted Feb. 5.

Washington—BRIDGE—U. S. Eng., 225 ft. steel truss bridge over Sauk River, Skagit Co., to W. T. Butler Co., Central Bldg., Seattle, $39,477. City of Seattle to share cost.

Washington — ROADS — Forestry Serv., Post Office Bldg., Portland, Ore., 13.009 mi. St. Henena Hy., Cowlitz Co. to A. Besoloff & Co., Seattle, $42,069; grading 1.227 mi. Rainier Natl. Forest, Lewis Co., to Coast Constr. Co., 2330 Fawcett St., Tacoma, $51,919; in Lane Co., to E. McNutt, Eugene, $52,550. Grand total $146,538.

Wash., Seattle—GRADING—Yards & Docks, Navy Dpt. grading, draining landing field at Sand Point Naval Base, to W. J. Gallagher & Son, 2817 Fort St. W., $30,794. Est. $45,000.

Wyo., Fort Warren—QUARTERS—Con. Q.M., Fort Francis E. Warren, 3 company and 3 noncommissioned officers' quarters, 1 detachment barracks, to C. C. Madsen, 515 Williams St., Denver, Colo., $131,213. Noted Jan. 15.

RAILWAYS

PROPOSED WORK

Louisiana—New Orleans Pub. Serv. Co., 317 Baronne St., New Orleans, renewing tracks for street railways over several streets $50,000; various types paving portions several streets between railway tracks, $75,000.

British Columbia—Green Point Logging Co., Ltd., 744 Hastings St. W., Vancouver, surveys 20 mi. logging railway from Fraser River to Harrison Lake Timber Limits, $150,00. Private plans.

Ontario—Canadian Pacific Ry., H. O. Windsor St. Sta., Montreal, Que., J. M. R. Fairbairn, ch. engr., rock ballasting 90 mi. railway from Milton to London, $2,000,000. Work will be probably done by day labor.

Ontario—Cornwall Street Ry. Co., 16-2nd St., Cornwall, W. L. McFarlane, 16-2nd St., Cornwall, engr., extending street railway on Cumberland St. from 2nd to 7th Sts. in Cornwall, $25,000. Work will probably be done by day labor.

CONTRACTS AWARDED

Massachusetts—Boston & Maine R.R. Co., 150 Causeway St., Boston, W. J. Backes, ch. engr., 1 story, rein.-con. roundhouse at railroad yard, in Billerica, to H. Wales Lines Co., 134 State St., Meriden, Conn. Est. $45,000.

GRADE CROSSINGS

PROPOSED WORK

Mass., Boston—City, Dpt. P. Wks., underpass under traffic circle at Charles and Cambridge Sts., in connection with elevated station, $60,000. Boston Elevated Ry. Co. to stand greater part of expense.

Mass., Framingham—Commonwealth of Massachusetts, Dpt. P. Wks., State House, Boston, Town, and New York, New Haven & Hartford R.R., E. E. Oviatt, ch. engr., New Haven, Conn., grade crossings, overpass, underpass at South Framingham and Framingham Junction, $6,500,000. A. W. Dean, Dpt. P. Wks., State House, Boston, engr.

Mass., Lancaster—Commonwealth of Massachusetts, Dpt. P. Wks., State House, Boston, Town, and Boston & Maine R.R., W. J. Backes, ch. engr., Boston, grade crossing, overpass, Dolphins Crossing, Town Way, $70,000. A. W. Dean, Dpt. P. Wks., State House, Boston, engr.

Mass., Worcester—Commonwealth of Massachusetts, Dpt. P. Wks., State House, Boston, City, and Boston & Maine R.R. Co., W. J. Backes, ch. engr., Boston, grade crossing, overpass and underpass, Lincoln Sq., city way, $4,500,00. A. W. Dean, Dpt. P. Wks., State House, Boston, engr.

N. Y., Cohoes—City grade crossing over Delaware & Hudson R.R., on Main St. $225,000. H. E. Gabriels, city engr.

Okla., Erick—Postponed indefinitely $50,000 bond election, natural gas system. E. E. Conner, mayor. Noted Jan. 22.

Tex., Amarillo—City discarded private gas franchise and plans constructing municipal system, incl. 40,000 lin.ft. 2- to 8-in. c.i. screw joint pipe, $75,000. Interested pipe dealers should communicate with city immediately. E. N. Stanley, city engr.

BIDS ASKED

N. Y., Brooklyn—Apr. 10, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, constructing Linden Blvd. Undercrossing at Livonia Ave. Yard.

Ont., Scotia — Mar. 31, by Canadian Natl. Rys., T. T. Irving, ch. engr. (Central Region) Union Sta., Toronto, concrete abutments for 2 hy. bridges over Canadian Natl. Rys. at points 1.04 mi. north of and 0.33 mi. east of here.

CONTRACTS AWARDED

Ont., Breslau—Canadian Natl. Rys., T. T. Irving, ch. engr., (Central Region), New Union Sta., Toronto, concrete, steel subway under Canadian Natl. Ry., on Hy. 7, to Ontario Constr. Co. Ltd., Bank of Toronto Bldg., St. Catharines. Est. $30,000. Noted Jan. 29.

Ont., Hamilton—Dominion Constr. Co., (general contractor) Reford Bldg., Toronto, sewers and excavation for grade separation and 5 subways, to A. Cope & Son, 19 Albert St., structural steel, to Hamilton Bridge Co., Bay St. N., for Toronto, Hamilton & Buffalo Ry., James St., R. L. Latham, ch. engr. Total est., $1,500,000. Noted Feb. 19, under "Contracts Awarded."

Ont., Toronto—T. T. Irving, ch. engr. (Central Region) Canadian Natl. Ry. New Union Sta., rein.-con. subway under Canadian Natl. R.R. on St. Clair Ave. W. to R. H. Mason Constr. Co., 417 Strathmore Blvd. Est. $100,000. Noted Feb. 5.

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PIERS AND WHARVES

PROPOSED WORK

N. Y., Charleston (sta. Staten Island)—PIER—Standard Oil Co. of New York, 26 Bway., New York, soon lets contract 26 ft. timber pier with timber pile work clusters. $25,000 or more. Private plans.

R. I., Providence—State, Finance Comr. F. S. Peck, reconstructing State Pier 1, improving property, Allens Ave. $350,000. Engineer not selected.

CONTRACTS AWARDED

N. Y., New York—PIER—M. Cosgrove, comr. Docks, Pier "A," Battery Pl., Pier New 32, foot Canal St., to J. Rich Steers, Inc., 17 Battery Pl., $448,275. Noted Feb. 19.

AIRPORTS

PROPOSED WORK

Ga., Savannah—City, Airport Com., H. E. Wilson, chn., soon takes bids administration building installation lighting system at Savannah Airport.

Mass., Falmouth—Town, W. M. Denny, Bd. Selectmen, airport. $50,000. Engineer not selected.

Mass., Norwood—Aviation Country Club, 551 5th Ave., New York, soon lets contract (without competition), hangar, clubhouse and equipment. $40,000.

Tex., Dallas—City, c/o E. Goforth, city secy., enlarging airport field, constructing necessary drainage, etc. Election Apr. 7, $300,000, for same.

CONTRACTS AWARDED

N. Y., Jackson Heights — Holmes Air Port, Northern Blvd., 85 x 200 ft. zeppelin hangar, 90 ft. high, to Austin Co., 120 Bway., New York. Est. $60,000. Goodyear Zeppelin Corp., 1144 East Market St., Akron, O., lessee.

GRAIN ELEVATORS

CONTRACTS AWARDED

Neb., Fremont — GRAIN ELEVATOR — Fremont Mills Co., 130,000 bu. grain elevator addition, to Burrell Eng. & Constr. Co., 1 Canal St., Chicago, Ill. Est. $40,000.

POWER AND LIGHTING

PROPOSED WORK

Texas — See "Unclassified, under Contracts Awarded.

CONTRACTS AWARDED

Calif., San Francisco—University of California, Berkeley, steam lines, distribution of electricity, to C. A. Langlais, 472 Tahama St., $20,936; distribtution steam and air at campus, to Turner Co., 329 Tahama St., $25,283.

Conn., Hartford—Hartford Electric Co., 266 Pearl St., removing overhead wires, installing conduit system in various streets. $200,000. Owner builds. Private plans.

Massachusetts—Athol Gas & Electric Co., Main St., Athol, 66,000 volt transmission line from Athol to Royalston Center. Est. exceeds $25,000. Owner builds. Private plans.

Mich., Detroit—Public Lighting Comn., E. Atwater St., furnishing 500 metal lighting poles, to Line Material Co., South Milwaukee, Wis., at $136.87 each; 500 metal lighting poles, to Union Metal Mfg. Co., 1432 Maple Ave. N. E., Canton, O., $145 each.

PARKS AND SPORTS

PROPOSED WORK

Calif., Pomona—Bd. Comrs., Los Angeles Co., plans by K. Muck, co. archt., Hall of Records Bldg., 10,000 seating capacity, steel, concrete grandstand, Fair Grounds. $225,000.

Conn., Litchfield—Owner, c/o Gaven Hadden, archt., 607 5th Ave., New York, bids late in April, athletic field. $15,000.

Conn., Middletown—Wesleyan University, Eng. Dpt., A. Davis, athletic field, baseball cage. To exceed $50,000. **Maturity after Apr. 10.** McKim, Meade & White, engrs., W. Mygren, heating engr., Kaiser, Muller & Davies, electrical engrs., all of 101 Park Ave., New York. W. W. Chapin, 110 East 42nd St., New York, structural engr.

Me., Gorham—Town, c/o Bunker & Savage, archts., 256 Water St., Augusta, soon takes bids 1 story, brick gymnasium at Senior High School. $25,000. Noted Mar. 5.

Me., Windham—Town, F. Aikens, in charge, gymnasium, auditorium. To exceed $25,000. Engineer not selected.

Mass., Boston—City, Park Dpt., 33 Beacon St., soon takes bids for approach to tower at Thomas Park, South Boston. $100,000. J. J. Murphy, Park Dpt., engr.

Mass., Falmouth—Town, Park Comrs., Town Hall, public bath houses at Old Silver Beach. $25,000 or more.

Mass., Lawrence—City, M. A. Lander, mayor, concrete public swimming pool, Ward 5. $25,000. Engineer not selected.

Mass., Montague—See "Bridges."

Mass., Somerville (br. Boston)—City, Park Dpt., soon takes bids concrete field house, grand stand, Glen St. $25,000. Gray & Hefferman, 175 High St., Boston, Archts. Noted Dec. 11.

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Mo., St. Louis—Bd. P. Serv. soon takes bids 1 story, basement, 82 x 116 ft., brick, rein.-con. bath house, incl. 35 x 75 ft. swimming pool, lockers, at Jefferson Ave. and Adams St. $100,000. F. A. Updegraff, 329 Municipal Courts Bldg., archt.

N. J., Clifton—C. E. Cole, 253 Bellevue Ave., Upper Montclair, 75 x 165 ft., rein.-con., tile swimming pool, Grove St. $25,000 or more. A. E. Ramhurst, 516 Bloomfield Ave., Montclair, engr. Noted Mar. 19.

N. J., Jersey City—Hudson Co. Park Comn., 921 Bergen Ave., grading, sodding, running track, for athletic field. $100,000. **Maturity probably soon.** Private plans.

N. J., Ridgewood—Bd. Village Comrs., 29 Hudson St., will not build concrete, tile swimming pool, North Maple and Linwood Aves. Project abandoned. R. A. Horton, village, engr. Noted Feb. 26.

N. J., Union City—Bd. City Comrs., City Hall, stadium, running tracks, tennis courts, football field, golf course, $500,000. Project in abeyance. G. W. Thompson, 324 Montgomery St., Syracuse, N. Y., archt. H. C. Thourot, 708 Bergenline Ave., city engr. Noted Feb. 12.

N. Y., New Rochelle—College of New Rochelle, 41 Leland Ave., sports center, incl. gymnasium, stadium. $200,000. **Maturity about June.** Noted Mar. 5.

Ont., Queenston—Niagara Parks Comn., Administration Bldg., Niagara Falls, plans by Findlay & Faulis, 644 Erie St., Niagara Falls, concrete, brick, stone recreation building, incl. pavilion, dance floor, swimming pool, etc. Est. $150,000.

BIDS ASKED

Ia., Spencer—Apr. 6, by Clay County Fair Assn., 75 x 250 ft. concrete, steel grandstand, 4,400 seating capacity. $42,500. Allen & Vagtborg, 205 Wacker Dr., Chicago, Ill., engrs. Noted Jan. 1.

Mass., Abington—See "Contracts Awarded."

New York—Apr. 9, at office Taconic State Park Comn., 25 Market St., Poughkeepsie, dredging, filling 30,000 cu.yd. Rudd Pond, in town of North East, Dutchess Co. J. W. Bradner, Jr., ch. engr.; adv. E. N.-R. Mar. 26.

N. Y., Long Island City—Mar. 31, by Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, New York, curbing, rein.-con. paving areas adjacent to service building, and excavating, grading, top-soiling, etc., area adjacent to Richmond Hill entrance, both Forest Park; improving triangular plot bounded by Roosevelt Ave., Foster and 51st Sts., Sunnyside, Queens Boro.

N. Y., New York—Mar. 31, by S. Levy, pres. Manhattan Boro. Municipal Bldg., general contract altering and constructing public bath building addition, 35-47 West 134th St.

N. Y., New York—Mar. 31, by Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., chain link wire mesh fence at golf links, Pelham Bay Park.

N. Y., Rockaway Beach—Mar. 31, by Park Bd., W. R. Herrick, pres. Park Bd., Arsenal Bldg., New York, completing Contr. 1, foundation work for bathing pavilion in Jacob Riis Park, Stoughton & Plock, 250 East 43rd St., New York, archts. and engrs. Noted Mar. 5.

N. Y., St. George—Mar. 31, by Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, New York, excavating for lake, grading, filling swamp area, constructing spillway, rein.-con. culvert in Willowbrook Park at Bulls Head; also rein.con. or corrugated metal pipe drain in Willowbrook and new Springville Parks.

N. Y., Sunnyside—See "Contracts Awarded."

CONTRACTS AWARDED

La., Gretna—Gretna Swimming Pool Assn., general contract swimming pool, dressing rooms, to Reily-Ruckstuhl, Inc., Carondelet St., New Orleans. Est. $25,000. Noted Mar. 12.

Mass., Abington — Town, J. Shanahan, chn. Bd. Selectmen, athletic field, grading, etc., rear of high school, separate contracts.

N. Y., New York—Park Bd. W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, improving Pelham Bay Park, to T. DiRoma, 33 Evelyn Pl., $26,910. Noted Feb. 25.

N. Y., Sunnyside—Sunnyside Outdoor Recreation Center, 501 Madison Ave., lockers, locker and shower rooms, swimming pool, 51st St. and Roosevelt Ave., by day labor and separate contracts. $50,000. W. Haugaard, 21 West 45th St., New York, archt. Noted Feb. 26.

HEATING AND VENTILATING

BIDS ASKED

Ind., Indianapolis — Apr. 8, by Bd. Comrs. Indiana Insane Hospital, 3000 West Washington St., low pressure steam and vacuum return mains, hot water mains, rein.-con. tunnels, electrical system installed in tunnel. $35,000. Noted Feb. 19 under "Hospitals."

Mass., Brighton (sta. Boston)—Mar. 31, by A. H. Dow, archt., 192 Boylston St., Boston, heating, plumbing, electrical work in 2 apartment units Corey Rd. and Warren St., for Corey Road Realty Trust, c/o architect. To exceed $25,000.

Mass., Waltham—Mar. 31, by Dpt. Mental Diseases, State House, Boston, pipe and equipment for state hospital boiler house. $25,000 or more. A. C. Franklin, Inc., 25 Haverhill St., Boston, engrs.

N. Y., New York—Dpt. Hospitals, Municipal Bldg., bids about May 15, mechanical equipment for New York City Home Welfare Island, $50,000. Van Wart & Wein, 347 Madison Ave., archts. Noted Jan. 8.

CONTRACTS AWARDED

N. Y., New York—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., ventilating equipment for Line A, from Fulton to 207th Sts. or Independent Subway system City-Owned Rapid Transit R.R., to Wagner Eng. Co., 9th Ave. and 208th St., $289,950. Noted Feb. 19.

UNCLASSIFIED

PROPOSED WORK

Colorado—TELEPHONE IMPROVEMENTS—Mountain States Telephone & Telegraph Co., 931 14th St., Denver, will expend $8,000,000 during 1931 new telephone construction in Colorado, Arizona, Idaho, Montana, Utah, Wyoming, New Mexico, and El Paso County, Texas, extension and improvement in Rocky Mountain Region. $1,000,000. H. Reed, pres.

Conn., Hartford—VETERAN'S WAY, etc.—City and State, S. R. Spencer, lieut.-gov. A. Batterson, mayor, and G. H. Hollister, park supt., on com., of cost Veteran's Way at State Capital along Park River, Burr Memorial and Plaza, $1,500,000. City's share, $740,000. Engineer not selected.

Mass., Winthrop—COMFORT STATION — Town, G. W. Tibbetts, chn. Bd. Selectmen, concrete comfort station, storage building for park equipment at Ingleside Park. $25,000.

Mo., St. Louis—CREMATORY—Bd. P. Serv., soon takes bids 1 story, 20 x 30 ft., brick, rein.-con. crematory. $25,000. F. A. Updegraff, 329 Municipal Courts Bldg., archt.

N. J., South Amboy — DOCKS and TERMINAL—Sun Oil Co., M. Courtney, in charge, 1608 Walnut St., Phila., Pa., 2 story, basement docks and terminal, David and Augusta Sts. $250,000. **Maturity about May.** Noted Dec. 11.

N. Y., New York—FERRY and DOCK, etc.—Dpt. Plant & Structures, Municipal Bldg., ferry and dock, 92nd St. and East River. To exceed $40,000. **Maturity soon.**

N. Y., New York—FERRY and DOCK—Dpt. Plant & Structures, Municipal Bldg., ferry and dock repairs, 23rd St. and East River. To exceed $40,000. **Maturity soon.**

Okla., Alluwe — OIL PIPE LINE — Standard Pipe Line Co., c/o Standard Oil Company of Indiana, 910 South Michigan Ave., Chicago, Ill., preliminary plans 25 mi. pipe line into oil fields. $100,000. Private plans.

Tex., Ki'gore—TANK—Woodley Petroleum Co., Shreveport, La., 80,000 bbl. storage tank.

Tex., Refugio—CARBON BLACK PLANT, etc.—Luling Oil & Gas Co., Luling, carbon black plant to consume waste gas in Refugio field, 40,000,000 ft. capacity; preliminary surveys casinghead gasoline plant, near here.

BIDS ASKED

Ind., Michigan City—PRISON EQUIPMENT, etc.—Apr. 2, by W. H. Daly, warden, Indiana State Prison, furnishing, installing new water tube boilers, mechanical stokers, steam engine or turbine with generator, radial brick chimney, electrical switchboard, transformers, feed water pump, blower fan and forced draft equipment, boiler feed pump, miscellaneous boiler room equipment, $38,000. O. N. Muller, 610 Indiana Trust Bldg., Indianapolis, consult. engr.

N. Y., Amenia—REFRIGERATION—Apr. 15, by Dpt. Mental Hygiene, State Office Bldg., Albany, refrigeration work for Building D.M. Kitchen and Dining Room, at Wassaic State School; adv. E. N.-R. Mar. 26.

N. Y., Creedmoor—REFRIGERATION—Apr. 22, by Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, refrigeration, for Kitchen and Dining Room Building 3, Brooklyn State Hospital, Creedmoor Div.

N. Y., Pine Aire Station—REFRIGERATION—Apr. 22, by Dpt. Mental Hygiene, State Office Bldg., Albany, refrigeration work for Dining Room and Kitchen Buildings 8 and 13, at Pilgrim State Hospitals; adv. E. N.-R. Mar. 26.

Pa., Phila. — BOILER TUBES and STEEL PIPE—Mar. 31, by C. E. Walsh, purch. agt. Pennsylvania R.R. Co., 15 North 32nd St., Contr. 10—1931, boiler tubes; Contr. 11—1931, steel pipe.

Tex., Beaumont—City, c/o P. Millard, secy., bids about May 5, 36x110 ft., rein.-con., timber loading and unloading wharf, incl. complete latest type machinery for loading and unloading. $200,000. R. C. Black, city engr. Noted Feb. 19.

CONTRACTS AWARDED

Calif., Sacramento—FAIR BUILDINGS—State of California, B. G. McDougall, state archt., Pub. Works Bldg., general contract 1 story, brick live stock building, State Fair Grounds, to F. L. Hansen, 282 7th St., San Francisco, $97,500. Noted Feb. 5.

Mass., Oak Bluffs — COMFORT STATION — Town, J. B. Billings, chn. Bd. Health, 1 story, concrete comfort station, to P. J. Taeger, Oak Bluffs. Noted Mar. 5.

N. Y., New York—RECTIFIER STATIONS—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., underground rectifier stations, Route 78, Sect. 4-2, Route 106, Sect. 1-2, to M. C. Seelig Co., Inc., 153 Pierrepont St., Brooklyn, $81,670. Noted Feb. 19.

Unclassified (continued)

N. Y., New York—RESTAURANT, etc.—J. M. Donovan, 11 East 43rd St., restaurant, kitchen equipment, etc., to T. J. Murphy, 2 West 45th St. Est. $150,000.

N. Y., New York—SPECIAL WORK, etc.—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., special work Group 1, to Ramapo Ajax Corp., 230 Park Ave., $21,829; special work, Group 2, to William Wharton, Jr. Co., 110 East 42nd St., $44,990; protection board brackets, to Shield Electric Co., 149 Bway., $17,548; contact rail insulators, to Ohio Brass Co., 50 Church St., $17,274; contact rail, appurtenances, to Acme Steel & Malleable Iron Wks., 32 Nassau St., $10,859; contact rail caps, to W. G. Creamer & Co., 572 Smith St., Brooklyn, $16,217; open hearth contact rail, to Bethlehem Steel Co., 25 Bway., $315,440. Grand total $444,157. Noted Feb. 19.

N. Y., New York—STATION FINISH—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., station finish for Jay Street-Boro Hall, Bergen and Carroll St. Stations, to Charles Meads & Co., 217 West 14th St., $320,899. Noted Mar. 5.

Texas—NATURAL GAS PIPE LINE—Big Bend Gas Co., S. S. Woods, secy., Fort Stockton, 107 mi. 8 in. c.i. natural gas pipe line from point north of Fort Stockton to Alpine and Marfa, $400,000, owner builds; also constructing 3 complete, natural gas distributing stations, $300,000, owner probably will build. Private plans.

Texas—OIL PIPE LINE—Oklahoma Natural Gas Corp., 624 South Boston St., Tulsa, Okla., and San Angelo, Tex., stringing 45 mi. 10 in. c.i. bell joint oil pipe line from Big Lake to Girvin and stringing 75 mi. 10 c.i. bell joint oil pipe line between San Angelo and Big Lake fields, to Allhands & Davis, Southwestern Life Bldg., Dallas and San Angelo, $50,000 and $75,000 respectively.

MATERIALS

BIDS ASKED

PIPE—**Manteca, Calif.**—Apr. 6, by A. Gianelli, city clk., 2,820 ft. Class B sand cast, Class 150 Mono cast or Class 150 DeLavaud 6 in. Bell and Spigot end c.i. pipe with necessary fittings.

ROAD TAR—**Hartford, Conn.**—Apr. 7, by Bd. Contr. & Supply, J. S. Buck, secy., furnishing City Street Dpt., 20,000 gal. road tar for cold patching and 50,000 gal. tar for hot patching; adv. E. N.-R. Mar. 26.

COPPER WIRE—**Anderson, Ind.**—See "Power Plants," under Proposed Work.

SEWER PIPE—**Clinton, Ind.**—Apr. 6, by Bd. City Comrs., W. A. Rein, aud., different sizes and weights sewer pipe. $2,000.

WATER MAIN and FITTINGS — **Galesburg, Ill.**—Water Dpt., City Hall, in market for 1 car load 4 and 6 in. c.i. water-main, fittings.

OIL CULVERT PIPE—**Montezuma, Ia.**—See "Streets and Roads."

BRIDGE MATERIAL — **Baton Rouge, La.**—Mar. 31, Road & Bridge Comr., East Baton Rouge Parish, Court House, 3x12 in., 4x6 in., 6 x 8 in. and 8x8 in., 10-20 ft., 10x10 in. and 12x12 in., 10-30 ft. No. 1 common Louisiana red cypress or redwood structural bridge lumber. C. M. Bomar, acting secy.

IRON CASTINGS, etc.—**Boston, Mass.**—Mar. 30, by Supply Dpt., P. A. Chapman, supt., manhole and catch-basins, frames and covers, catch-basin grates, tide gates, iron inlets. $5,000 or more.

CUTBACK ASPHALT—**St. Paul, Minn.**—Mar. 31, by C. A. Carlson, city purch. agt., 150,000 gal. cutback asphalt, 800,000 gal. No. 1 and 50,000 gal. No. 2 road oil. W. N. Carey, city engr.

ROAD OIL—**Winona, Minn.**—Apr. 6, by City, G. W. Hofman, recdr., 100,000- 150,000 gal. road oil.

LUMBER and PILING—**Woodville, Miss.**—Apr. 6, by Bd. Supervs, Wilkinson Co., 17,000 ft. creosoted lumber, 750 ft. creosoted piling.

PILES—**Ocean City, N. J.**—Mar. 30, by Bd. City Comrs., City Hall, 500 piles 25 ft. long for jetty and bulkhead work. $5,000. W. H. Collissen, Jr., city engr.

LUMBER—**New York, N. Y.**—Mar. 27, by P. J. Dooling, comr. Purchase, Municipal Bldg., lumber to Dpt. Parks—Manhattan.

MEDINA CURBING and BLOCK—**Cleveland, O.**—Mar. 27, by City, R. Hoffman, engineer, City Hall, 7,000 ft. 5 in. medina curbing and 10,000 sq.yd. 6 in. medina block.

VITRIFIED TILE, etc.—**Oberlin, O.**—Mar. 27 by Village, furnishing 21,600 ft. 12 in. vitr. tile, and laying 22,966 ft. 12 in. vitr. and c.i. pipe.

PIPE—**Afton, Wyo.**—City, taking bids 3,000 ft. 12 in. c.i. pipe, $7,000.

CONTRACTS AWARDED

RECUTTING GRANITE BLOCKS, etc.—**Boston, Mass.**—City, Dpt. P. Wks., recutting and redressing 100,000 granite paving blocks, to Toon Bros. & Wilson, 33 Howitt Rd., West Roxbury at $16.24 per 1,000.

CAST IRON PIPE and VALVES—**Springfield, Mass.**—City, Water Comrs., c.i. pipe, to U. S. Cast Iron Pipe & Fdry. Co., 1421 Chestnut St., Phila., Pa., $16,231; valves, to Chapman Valve Co., Indian Orchard, Springfield, $5,030.

CRUSHED LIME STONE—**Detroit, Mich.**—Dpt. Purchases & Supplies, 125,000 tons crushed limestone, f.o.b. delivered, to France Stone Co., Zug. Island, Detroit, $166,250.

ROAD OIL—**Winona, Minn.**—A. Baeuerlen, aud. Winona Co. 170,000 gal. road oil, to Standard Oil Co. of Indiana, 1300 Harmon Pl., Minneapolis, at $0.0408 per gal. Noted Feb. 26.

ROAD SURFACE DRESSING—**Freehold, N. J.**—Monmouth Co., Court House, 140,000 gal. tar road surface applied, to Tar Asphalt Serv., Inc., Lindeneau, at $0.43 per gal., total $50,200; 290,000 gal. asphaltic road oil, to M. R. Harris Contg. Co., Toms River, at $0.1512 per gal., total $43,848; 20,000 gal. lignin binder, to M. R. Young, Trenton, at $0.134 per gal., total $2,680. Grand total $96,728. Noted Feb. 5.

SEWER PIPE—**Dayton, O.**—City Purchasing Agent, 402 U. B. Annex, furnishing 2,712 ft. 60 in. B. and S precast concrete sewer pipe, to Price Bros., Harries Bldg., $16,272. Noted Mar. 12.

POROUS PLATES—**Milwaukee, Wis.**—Sewerage Comn., J. L. Ferebee, ch. engr., porous plates for diffusion compressed air, to Filtros, Inc., Cutler Bldg., Rochester, N. Y., at $1.34 each; total $15,300.

EQUIPMENT

BIDS ASKED

TRUCK—**Antioch, Calif.**—City Council taking bids 1½ ton motor dump truck.

STREET SWEEPER—**Santa Clara, Calif.**—Apr. 6, by A. J. Cronin, city clk., motor driven street sweeper for City.

GRADER — **Galesburg, Ill.** — Knox Co. Hy. Dpt., in market 9 ft. leaning wheel grader, $1,250. A. R. Smith, Galesburg, engr.

BATTERY MATERIAL—**Boston, Mass.**—Mar. 30, by Dpt. School Buildings, battery material as specified. $5,000.

MANHOLE STEPS—**Boston, Mass.**—Mar. 30, by Supply Dpt., wrought iron manhole steps to Dpt. P. Wks., as specified. $5,000. P. A. Chapman, supt. Supply Dpt.

MOTOR PUMPING ENGINE — **Stoneham, Mass.**—Apr. 2, by Town, Purchasing Com., Town Hall, motor pumping engine.

GRADER—**Elbow Lake, Minn.**—Apr. 6, by C. M. Nelson, aud. Grant Co., 1 motor patrol grader; 1 crawler type 20-40 hp. power tractor, 1 tractor-type maintenance grader.

WATER METERS—**Minneapolis, Minn.**—Mar. 31, by F. S. Gram, city purch. agt., 4,000 ¾ in. and 509 ¾- to 6-in. water meters. Former bids rejected. N. W. Elsberg, city engr.

GRADER—**St. Cloud, Minn.**—Apr. 8, by N. Thomey, aud. Stearns Co., 1 power maintenance patrol, grader and scarifier.

TRUCK, etc.—**Winona, Minn.**—Apr. 7, by A. Baeuerlen, aud. Winona Co., one 1½ ton truck with body and one 2-ton truck without body, one 12 ft. blade grader and one 60-80 hp. crawler type tractor.

TRUCK, etc.—**Glens Falls, N. Y.**—Dpt. P. Wks., H. L. Churchill, engr., bids about Apr. 18, new truck with spraying equipment for trees.

BOILER TUBES, etc.—**New York, N. Y.**—Mar. 30, by P. J. Dooling, comr. Purchase, Municipal Bldg., boiler tubes to Dpt. Plant & Structures; concrete incinerators to Dpt. Parks, Bronx and Manhattan; c. i. pipe, special and valve box castings, hydrant stand pipes and fenders to Dpt. Water Supply, Gas & Electricity.

TRACTOR—**Grand Forks, N. D.**—Apr. 7, by Grand Forks Co., M. O. Haugen, aud., one or more crawler type tractors not less than 60 hp.

STEEL BLADES—**Oklahoma**—Mar. 31, by State Hy. Dpt., Oklahoma City, 218 tons steel blades for road graders. A. R. Losh, hy. engr.

CONVEYORS, etc.—**Erie, Pa.**—Erie Sand & Gravel Co., West Front and Sassafrass Sts., taking bids plant improvement, incl. sand washing equipment, concrete founds., bins, tunnels, conveyors.

JAIL EQUIPMENT—**Beaumont, Tex.**—Apr. 13, by Jefferson Co., c/o B. B. Johnson, judge, furnishing all jail equipment for new court house. Former bids rejected. Babin & F. C. Stone, Beaumont, archts. Noted Mar. 5 under "Contracts Awarded."

ROAD EQUIPMENT — **Perth, Ont.** — **Lanark Co.** in market new road equipment. $2,500.

FOREIGN

England, Liverpool — Paramount Publix Theatres, Paramount Bldg., New York, c/o Foreign Theatres Dpt., theatres, $500,000. **Maturity indefinate.**

Commercial Buildings

RESIDENTIAL

BIDS ASKED

Fla., Miami Beach—W. F. Whitman, Miami Beach, and 732 Federal St., Chicago, Ill., taking bids 11 story, rein.-con., tile, gypsum, R. F. France, Miami Beach, and 155 North Clark St., Chicago, Ill., archt.

Mass., Brighton (sta. Boston)—Mar. 31, by Corey Rd. Realty Trust, c/o A. H. Dow, archt., 192 Boylston St., Boston, 2 units, 3 story, basement, 100 x 120 ft., brick, limestone, plain founds., Warren St., Corey and Bellvista Rds. $350,000.

Mass., Brighton (sta. Boston) — See "Contracts Awarded."

N. J., North Bergen — See "Contracts Awarded."

N. Y., Flushing—See "Contracts Awarded."

N. Y., Forest Hills—See "Contracts Awarded."

N. Y., Jackson Heights—See "Contracts Awarded."

N. Y., Jamaica—See "Contracts Awarded."

N. Y., Long Island City — See "Contracts Awarded."

N. Y., New York—See "Contracts Awarded."

N. Y., Queens Village — See "Contracts Awarded."

N. Y., Richmond Hill — See "Contracts Awarded."

O., Cleveland—H. Kestenbaum, 3565 Stoer Rd., taking bids 3 story, basement, East Berkshire Rd. $150,000. I. A. Wasserstrom, 944 East 123rd St., archt.

Pa., Jenkintown—See "Contracts Awarded."

CONTRACTS AWARDED

Conn., Bridgeport — W. F. Chatlos, 1640 Boston Ave., 3 story, 45 x 175 ft., 2 wings, 45 x 90 ft., brick, steel, Main St. $175,000. Owner builds. J. W. Northrop, 211 State St., archt.

Mass., Brighton (sta. Boston)—Eames Realty Trust, c/o B. Grossman, 133 Colborne Rd., Allston, 3 story, basement, brick, stone, steel, plain found., 100 Kelsyth Rd., separate contracts. Est. exceed $150,000. S. E. Moffie, 43 Tremont St., Boston, archt.

Mass., Cambridge — Reliance Co-operative Bank, 15 Dunster St., altering and constructing 4 story, basement, brick, stone apartment and store additions, plain founds., to Askin & Sullivan, 580 Massachusetts Ave. Est. $150,000.

N. J., Hoboken—Marlboro Co., c/o M. J. O'Leary, 730 Hudson St., 5 story apartment, 1013 Washington St., to D. M. Kelleher, 113 Highland Ave., Jersey City. Est. $180,000. Noted Dec. 25.

N. J., North Bergen—G. Bove, 138 Columbia Ave., two 3 story, basement, brick, steel, 103-109 Grand Ave., separate contracts. $150,000. G. Beal, 145 Summit Ave., Union City, archt.

N. Y., Forest Hills—Forest Hills Dwellings, Inc., Burns St. and Ascan Ave., 6 story, 74 x 102 ft., Burns St. and Ascan Ave., separate contracts. $200,000. Private plans.

N. Y., Flushing—Moss Bros., 163-18 Jamaica Ave., Jamaica, 2 story, 179th St. and 28th Ave., separate contracts. $150,000. D. Levinson, 163-18 Jamaica Ave., Jamaica, archt.

N. Y., Flushing—Skillman Building Corp., 50th St. and Skillman Ave., Woodside, apartment, Northern Blvd. and 172nd St., separate contracts. $225,000. Private plans.

N. Y., Jackson Heights—Island Housing Corp., 160-16 Jamaica Ave., Jamaica, apartment, 88th St. and 30th Ave., separate contracts. $250,000. A. Allen, 163-18 Jamaica Ave., Jamaica, archt.

N. Y., Jamaica—Mary Christe Kliene, c/o G. Schonewald, archt., Grand Central Terminal, New York, 6 story, 55 x 97 ft., Roman Ave. and Queens Blvd., separate contracts. $150,000.

N. Y., Long Island City—Gosman Apartments, Inc., 452 5th Ave., New York, 6 story, 75 x 200 ft., 48th St. and 43rd Ave., separate contracts. $195,000. Private plans.

N. Y., Long Island City—Greneck Constr. Corp., 402 New York Ave., Brooklyn, 4 story, 86 x 100 ft., 41st St. and 30th Ave., separate contracts. $150,000. Private plans.

N. Y., New York—Corporation, c/o D. Rose, 1750 Randall Ave., 6 story, basement, brick, steel, Randall Ave., vicinity Commonwealth Ave., separate contracts. $250,000. Springsteen & Goldhammer, 40 East 49th St., archts.

N. Y., New York—Furman Realty Corp., I. Weinstein, pres., 4750 Bronx Blvd., 6 story, brick, Furmans Ave. and 237th St., separate contracts, $230,000. Franklin, Bates & Heindsman, 2526 Webster Ave., archts.

N. Y., New York—J. F. Constr. Corp., I. Fish, pres., 1476 Walton St., 6 story, basement, 108 x 125 ft., brick, Walton Ave. and 176th St., separate contracts. $225,000. Lilien & Lilien, 645 East Tremont Ave., archts.

N. Y., New York—Leefan Realty Co., 1457 Boscobel Ave., 6 story, 124 x 181 ft., 180th St. & Segewick Ave., separate contracts. $400,000. C. Kreymborg, 2324 Marion Ave., archt.

N. Y., New York—One Hundred Twenty-One Seaman Avenue Realty Corp., to G. G. Miller, archt., 545 5th Ave., 6 story, 64x75 ft., 119 Seaman Ave., separate contracts. $150,000.

N. Y., New York—J. Poloso, Inc., 748 East 222nd St., 5 story, 90 x 100 ft., 222nd St. and White Plains Ave., separate contracts. $150,000. L. Pisciotta, 1912 Arthur Ave., archt.

N. Y., New York — Silweiss Constr. Co., I. Silverman, pres., 545 East 170th St., 6 story, basement, 94 x 100 ft., Waring and Olinville Aves., separate contracts. $175,000. N. Rotholtz, 241 East 170th St., archt.

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Residential (Continued)

N. Y., Queens Village—Queens Homes Co., Woodhaven Blvd. and 66th St., apartment, 235th and Seward Ave., separate contracts. A. Allen, 163-18 Jamaica Ave., Jamaica, archt.

N. Y., Richmond Hill—Curtis Building Co., 1210 Ocean Ave., apartment, 91st Ave. and 130th St., separate contracts. $150,000. S. Goldsmith, 4914 Church Ave., Brooklyn, archt.

Pa., Jenkintown—Jenkintown Hall Corp., c/o Master Masons, 1540 Wood St., Phila., 7 story, basement, 120x160 ft. apartment, Greenwood and Florence Aves., separate contracts. $600,000. J. E. Fieldstein, Otis Bldg., Phila., archt.

CLUBS

PROPOSED WORK

Conn., Fairfield—St. Thomas Roman Catholic Parish, W. J. Blake, pastor, soon lets contract 1 story, basement, 55x100 ft., brick, stone parish hall. $150,000. W. Schmidt, 144 Golden Hill St., Bridgeport, archt. Noted Mar. 19, under "Bridgeport."

Mass., Fitchburg—First Baptist Church, M. A. Cutter, chn. comn., 732 Main St., revised plans by A. M. Francis & Son, 804 Main St., remodeling chapel, 632 Main St. $150,000. American Baptist Home Missionary Society, 23 East 26th St., New York, adv. archt.

Mass., Quincy—Quincy Y. M. C. A., Washington St., plans new Y. M. C. A. building on site between President's Lane and Upland Rd. $500,000-$750,000. Architect not selected.

N. J., Guttenburg—Little Church on the Hill, D. R. Reese, pastor, 326 24th St., plans by W. G. Bartels, 270 Main St., Hackensack, rebuilding 2 story, basement, brick, steel, Bergenline Ave. $150,000. Noted Mar. 5.

N. J., Perth Amboy—St. Mary's Roman Catholic Church, c/o G. W. Brooks, archt., 216 Smith St., revised plans 3 story, basement, brick, steel convent, Mechanic St. $250,000. Noted Feb. 26.

N. J., Westwood—Jewish Community, Washington St., 2 story, basement, brick, steel temple, Washington St. and St. Nicholas Ave. $150,000. **Maturity probably soon.**

BIDS ASKED

Ia., Waterloo—Waterloo Y.M.C.A. S. A. Cohagen, secy., bids about Apr. 15, club, concrete, marble, tile, brick club, 18 West 4th St. $300,000. M. B. Cleveland, 424 East 4th St., archt. Noted July 31.

Tex., Fort Worth—Apr. 7, by Masonic Temple, c/o W. S. Cooke, Fort Worth Natl. Bank Bldg., superstructure 4 story, basement, 120x167 ft., stone, rein.-con. masonic temple, North and Henderson Sts. $625,000. W. G. Clarkson & Co., 610 1st Natl. Bank Bldg., archts. Noted Nov. 13.

HOSPITALS

PROPOSED WORK

Conn., Mansfield — State, Mansfield State Training School & Hospital, plans by Golden Storrs & Co., 983 Main St., Hartford, brick, steel nurses home, administration building addition, dormitory. $200,000. Noted Feb. 12.

Mass., Belchertown — Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, hospital infirmary. $125,000-$150,000. Architect not selected.

Mass., Boston—City, Hospital Dpt., sketches by J. H. Ritchie & Associates, 250 Stuart St., altering L. G. Burnham Memorial Hospital Ward Building, 3 story, basement, brick, Harrison Ave. $150,000.

N. J., Hasbrouck Heights—Hasbrouck Heights Hospital, H. K. Cohan, supt., 272 Columbus Ave., bids probably in June, 3 story, basement, 100x112 ft., brick, steel, elevators, Columbus Ave. $150,000. Noted Mar. 19.

N. J., New Brunswick—St. Peters Hospital, Easton Ave., brick, steel, nurses' home. $150,000 or more. Architect not selected. **Maturity probably soon.**

N. Y., Brooklyn—Trinity Hospital, 75 Sunnyside Ave., will award contract in April, hospital, East New York Ave. and Fulton St. $225,000. A. Weiser, 510 Madison Ave., New York, archt.

N. Y., Elmhurst—Dpt. Hospitals, Municipal Bldg., New York, hospital, Queens Blvd. and Grand Ave. $2,500,000.

N. Y., Troy—Leonard Hospital, 41-114th St., plans by W. E. Clark, Cannon Pl., 2 story, basement, brick, rein.-con., hospital wing, Peoples Ave. $200,000.

Vt., Brattleboro — Brattleboro Memorial Hospital, C. Brian, supt., administration building and other improvements at hospital. $150,000 or more. Architect not selected.

Wis., Wauwatosa — Milwaukee Co. (Milwaukee) plans by Van Ryn & DeGelleke, 114 Wisconsin Ave., Milwaukee, 5 story, 160 x 180 ft., brick, rein.-con., nurses' home.

Que., Ste. Marie de Beauce—Hospital Bd., Soeurs de la Charite, J. E. Feuiltault, curate, plans by R. Chenevert, 132 St. Peter St., Quebec, and takes bids in May, hospital. $200,000.

BIDS ASKED

Mass., Roxbury (sta. Boston)—Apr. 4, by Kendall, Taylor & Co., archts., 209 Columbus Ave., Boston, 1 and 4 story, basement, irregular sized, brick, stone, steel hospital addition, plain found., Parker Hill Ave., for New England Baptist Hospital, Corp., 85 Parker Hill Ave. $200,000. Noted Feb. 26.

N. J., New Brunswick—Maginnis & Walsh, archts., 100 Boylston St., Boston, Mass., bids

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about May 15, completing 5 story, basement, 48x105 ft. main building and constructing two 5 story basement, 45x110 ft., brick, steel hospital addition for St. Peters Hospital, Easton Ave. $200,000. Noted Jan. 29.

N. Y., Brooklyn—Dpt. Hospitals, Municipal Bldg., New York, bids about July 1, general contract admitting and emergency building, also refrigeration plant, at Coney Island Hospital. G. M. McCabe, 96 5th Ave., New York, archt.

N. Y., Dongan Hills—Mar. 30, by J. G. W. Greef, comr. Hospitals, Municipal Bldg., New York, general contract 16 steel, asbestos dormitory buildings and concrete transformer building, at Sea View Hospital, Manor Rd.

N. Y., New York—Mar. 30, by Dpt. Hospitals, J. G. W. Greef, comr. Municipal Bldg., altering and constructing additions to main building and nower house at out patients' building, Gouverneur Hospital. M. Bernstein, 2 Columbus Circle, archt. Noted Sept. 25.

CONTRACTS AWARDED

Calif., Los Angeles—Bd. Supervs. Los Angeles Co., high pressure refrigeration for Acute Unit county hospital, to Gay Eng. Co., 2650 Santa Fe Ave., $54,280: low pressure refrigeration, to Parker Ice Machine Co., 2600 Santa Fe Ave., $75,646. Noted Mar. 20, 1930.

Ind., Indianapolis—Bd. Comrs. Indiana Insane Hospital, 3000 West Washington St., general contract 3 story, basement, brick, rein.-con. hospital for men, to Brown & Mick, 1020 East Michigan St., $118,970; heating, to F. G. Janitz, 916 Virginia Ave., $13,172; plumbing, to Callon Bros., 24 South Alabama St., $13,170; electric wiring, to C. L. Smith, 122 South Pennsylvania St., $3,380. Grand total $146,982. Noted Feb. 19.

Ind., North Madison—Madison Hospital, general contract State Insane Hospital, laboratory, 2 buildings for women, steel, brick, to E. Ainsworth & Son Constr. Co., 1248 Hulman St., Terra Haute. Est. $150,000.

CHURCHES

PROPOSED WORK

Ind., Ft. Wayne—St. Vincents Orphans Home, plans by A. M. Strauss, 415 Cal-Wayne Bldg., brick, steel orphans home, incl. school, chapel and priests home, Wells St. and Archer Ave. $500,000.

Mass., Lowell—Our Lady of Lourdes Roman Catholic Church, J. Fortier, 726 Merrimack St., sketches by W. F. Fontaine, 285 Main St., Woonsocket, R. I., 1 story, basement, brick, stone Smith Ave. $150,000.

Mass., Springfield — Union Congregational Society, revised plans by R. B. Warner, 129 Ingersoll Grove, 1 and 2 story, basement, brick, stone church, parish house, plain found., Pine Point. $150,000 or more. Former bids rejected. Noted Sept. 4.

N. J., Newark—Our Lady of Mount Carmel Roman Catholic Church, E. D. Aquilla, pastor, East Mechanic St., sketches by H. J. Weiler, 40 Komorn St., 2 story, basement, brick, steel, Oliver St. between Adams and Van Buren Sts. $150,000.

N. Y., New York—Hellenic Eastern Orthodox Church, 46 East 92nd St., plans by Holmes & Converse, 101 Park Ave., church, 319 East 74th St. $300,000.

R. I., Providence — St. Matthew's Roman Catholic Parish, plans by A. J. Murphy, 25 Fenner St., brick, stone church, and 8 room parochial school unit, Elmwood and Park Sts. $150,000. Noted July 3.

BIDS ASKED

N. J., East Orange — First Congregational Church, E. R. Holden, pastor, 2 North Grove St., bids about June 1, general contract 2 story, basement, brick, steel church. $150,000. Noted Mar. 12.

N. J., Irvington (br. Newark) — Methodist Episcopal Church, R. L. Luerich, pastor, 64 Myrtle Ave., bids about June 1, general contract 2 story, basement, brick, steel church. $200,000. N. Hulme, 1524 Chestnut St., Phila., Pa., archt. Noted Feb. 26.

CONTRACTS AWARDED

Wash., Seattle—St. Edwards Seminary, 4 story, basement, 40 x 354 ft. seminary with 60 x 85 ft. wing, Lake Washington, to Henrikson-Alstrom Constr. Co., Securities Bldg., $445,050. Noted Oct. 23.

B. C., Vancouver—Twizell & Twizell, archts., 719 Metropolitan Bldg., 1 story, tower, 131 x 189 ft., granite, rein.-con. church, plain found., Burrard and Nelson Sts., to E. Davies, 500 Beatty St., for St. Andrews-Wesley United Church, Burrard and Georgia Sts. $234,000. Noted Aug. 21.

SCHOOLS

PROPOSED WORK

Calif., Fresno — State of California, Sacramento, plans by Swartz & Ryland, Brix Bldg., library and administration at State Teachers College. $200,000.

Calif., Las Banos—West Side Union High School Dist. defeated $175,000, high school. Noted Mar. 5.

Conn., Waterbury—City, Bd. Educ., plans by J. J. Scolan, 8 Spark St., 2 story, basement kindergarten and grade school, Fairlawn School, Frost Rd. and Homestead Ave. $150,000.

Ga., Young Harris—Young Harris College, c/o J. T. Lance, pres., new classroom building. $225,000.

Ill., East St. Louis—St. Patricks Catholic Parish, P. J. Byrne, pastor, 612 Illinois Ave., soon lets contract 120 x 156 ft. parochial school, 61 x 38 ft. rectory with 22 x 20 ft. attached garage, both 2 story, basement, rein.-con., brick, steel, concrete found., Summit Ave. between 33rd and 34th Sts. F. A. Ludewig & Co., 3115 South Grand St., St. Louis, Mo., archts., Taxis & Becker, Chemical Bldg., St. Louis, Mo., engrs.

Ind., Mackey—School Comrs. plans by Sutton & Routt, Vincennes, 2 story, basement, 60x104 ft., brick, steel grade and high school. $150,000.

Ind., Plainfield—Bd. School Comrs. plans by Parker & Faulstich, Bd. of Trade B'dg., Indianapolis, brick, steel high school addition, incl. gymnasium, auditorium. $150,000.

Me., Gorham—State Normal School, W. E. Russell, principal, sketches by R. Mayo, 465 Congress St., Portland, 1 and 2 story, basement, brick gymnasium, auditorium. $150,000. Noted Feb .19.

Mass., Abington—Town, J. Shannahan, chn. Bd. Selectmen, sketches by J. W. Beal Sons Co., 185 Devonshire St., Boston, 2 story, basement, brick high school, incl. gymnasium, assembly hall, North Abington Sect. $150,000 or more.

Mass., Brookline (br. Boston) — Town, Bd. Selectmen, new sketches by M. P. Meade, 80 Boylston St., Boston, 2 story, basement, brick, stone, school, Walnut St. $390,000 appropriated.

Mass., Falmouth—A. L. Pattee, chn. School Bd., 2 story, basement, brick, school. $175,000 appropriated. Architect not selected. Noted Jan. 8.

Mass., Hanover—Town, E. Sylvester, chn. Building Comr., altering and constructing 2 story, basement high school addition. $150,000. Architect not selected.

Mass., Medford (br. Boston)—**Tufts College** plans by Andrews, Jones, Biscoe & Whitmore, 50 Congress St., Boston, 3 story, brick, steel gymnasium. $200,000. Noted Mar. 20, 1930.

Mass., Nantucket—Town, Bd. Selectmen, sketches by W. Tallman, 212 Union St., New Bedford, 2 story, basement, 80 x 105 ft., brick school, plain found., Atlantic Ave. $150,000.

Mass., Saugus—Town, Bd. Educ., sketches by R. T. Jackson, 44 School St., Boston, 2 story, basement, brick, stone high school, plain found. $550,000. Fay, Spofford & Thorndike, 44 School St., Boston, engrs. Noted Jan. 16, 1930.

Mass., West Boylston—Building Comn., Town Hall, sketches by Cutting, Carlton & Cutting, 44 Front St., Worcester, Junior-Senior High School, 1 and 3 story, 21x62 ft. and 65x132 ft., brick, steel, Crescent St. $250,000. A. J. Daniels, Shrewsbury, advisory archt. Noted Oct. 9.

Mich., Detroit — Bd. Educ., 1354 Broadway Ave., plans by Van Leyen, Schilling & Keough, 3440 Cass Ave., 2 story, basement, 68 x 326 ft., brick, steel, rein.-con., stone, plain found., Lawton Ave. $150,000.

Mich., Grosse Pointe—Bd. Educ., plans by O'Dell & Rowland, 710 Donovan Bldg., 2 story, basement, brick, steel, concrete, plain found., Kercheval Ave. $300,000.

N. H., Hanover—Beta Theta P. Fraternity of Dartmouth College, sketches by Wells & Hudson, Main St., fraternity building. $150,000 or more.

N. H., Rochester—City, L. McDuffee, City Hall, sketches by W. S. Holmes Co., Lansing, Mich., and 18 Newbury St., Boston, Mass., 2 story, basement, brick, stone school, Maple St. $150,000.

N. J., Jamesburg—Bd. Educ. plans by J. N. Pierson & Son, 198 Jefferson St., Perth Amboy, 2 story, basement, 85x185 ft., brick, steel, rein.-con. high school, incl. auditorium, gymnasium, plain found., Davidson Estates. $150,000 appropriated. Noted Mar. 12.

N. J., Lakewood—Bd. Educ., 2 story, basement, brick, steel school. $200,000. Project in abeyance. C. B. Cook, Asbury Park Trust Bldg., Asbury Park, engr. Noted Feb. 5.

N. J., Long Branch—Bd. Educ., Long Branch, 2 story, basement, brick, steel school addition, Bway. $150,000. Project in abeyance. H. I. Braun, 501 Harrison St., archt. Noted Feb. 26.

N. J., Ridgewood—Bd. Educ., J. Kollmar, secy., School 1, Beech St., sketches by Fanning & Shea, 49 Ward St., Paterson. Junior and Senior High School, 2 story, basement, brick, steel, rein.-con. $150,000 or more. Noted Mar. 19.

N. J., Union—Bd. Educ. 2 story, basement, brick, steel addition to Connecticut Farms School, Chestnut St. $200,000. Architect not selected. **Maturity probably soon.**

N. J., Union—Bd. Educ. sketches 2 story, basement, brick, steel, Stuyvesant Heights. $150,000. F. A. Elsasser, 1000 Stuyvesant Ave., probable archt. Noted Mar. 9.

N. Y., Whitestone—St. Lukes Church, 150th Pl. and 17th Ave. plans by C. Ward, 431 West 14th St., New York, altering and constructing school, convent additions, Cross Island Blvd. $150,000.

O., Mt. Union (sta. Alliance)—Mt. Union College, W. H. McMaster, pres., sketches by Walker & Weeks, 2341 Carnegie Ave., Cleveland, 2 story, brick, steel, concrete music hall. $175,000.

O., Sugarcreek—Tuscawaras Co. Bd. Educ., New Philadelphia, bids latter part April, Junior-Senior High School, 2 story, basement, 35 x 60 ft., brick, incl. physical education room, gymnasium, and 250 seating capacity, balcony. $150,000. C. J. Marr, New Philadelphia, archt.

Schools (Continued)

Pa., Ambridge—Bd. Educ. plans by W. W. Williams, Fitzsimmons Bldg., Pittsburgh. Senior High School, brick, steel, Duss Ave. $300,000.

Pa., Pittsburgh—C. Strong, archt., Keystone Bldg., Pittsburgh soon lets contract brick, steel school, Concordia Ave. for St. Basils Roman Catholic Church. L. Stenger, pastor, 1735 Brownsville Rd.

Pa., Pittsburgh — University of Pittsburgh Aliquippa St., plans by Janssen & Cocken, Century Bldg., Fannie Edel Malk Memorial Elementary School, 2 story, basement, 50 x 100 ft., brick, steel, incl. nursery school, kindergarten, playrooms, sun porches, auditorium, Aliquippa St. $325,000. Stone & Webster, Union Trust Bldg., superv. engrs.

Tex., Crane—Bd. Educ. plans by Peters, Strange & Bradshaw, Big Springs, 2 story, brick, rein-con. high school, auditorium, offices, etc., plain found. $125,000-$150,000 bonds voted for same.

Vt., Northfield—Sigma Phi Epsilon Fraternity, Norwich University, plans by H. Goodspeed, 148 State St., Boston, Mass., 3 story, basement, brick fraternity house, University Grounds. $150,000.

Ont., Hamilton—Bd. Educ., City Hall, plans by W. J. Walsh, Terminal Bldg., 2 story, basement, brick, stone, concrete, steel addition to Queen Mary School, Cannon St. E. $175,000.

Ont., Kingston—Bd. Educ.—passed by law constructing industrial school. $214,000. Noted Dec. 25.

Ont., Kingston — Bd. Educ. plans by C. Drever, 81 Brock St., 3 story, basement, brick, stone, steel, concrete, vocational and technical school. $350,000. Noted Feb. 19.

Que., Montreal — Montreal Roman Catholic School Comn., V. Dore, pres., J. Casgrain, secy., 117 Ste. Catherine St. W., plans by E. Larose, 3733 Berri St., school for girls, Parish St. Louis de France, $225,000; plans by J. O. Marchand, 276 St. James St. W., school for girls, Parish St. Alphonse, $200,000, both in Central Dist.; also plans schools in Northern and English Dists., architects not selected. All above, for 1931 program. A bill requesting the right to borrow $3,000,000 has been passed by the Provincial Legislature.

Ont., Toronto—A. Strachan, bishop, 2 or 3 story, basement, brick, stone, rein.-con., steel school addition, Lonsdale Ave. $150,000 or more. Architect not selected.

BIDS ASKED

Calif., San Francisco—University of Stanford, Palo Alto, sketches Medical School and Hospital, Sacramento and Webster Sts. $2,500,000.

Ga., Atlanta—Atlanta University, J. Hope, pres., 643 Hunter St. S.W., bids about June 1, general contract brick, steel, rein.-con., tile library, Chestnut St. $450,000. James, Gamble & Rogers, 154 East 46th St., New York, archts.

Ill., Chicago—Mar. 31, by Bd. Educ., 188 West Randolph St., E. Withall, bus. mgr., Rembrandt Junior High School, Yates Ave. and East 82nd St., Galileo Junior High School, North Central and Fullerton Ave., Dvorak Junior High School, 18th St. and Kildare Ave. $1,500,000 each. P. Gerhardt, 188 West Randolph St., archt.

Mass., Townsend—Mar. 30, by E. S. Bagler, chn. Bd. Selectmen, 2 story, basement, 120 x 120 ft., brick, stone school, plain found., Centre St. $150,000. C. R. Whitcher, Beacon Bldg., Manchester, N. H., archt. Noted Mar. 12.

Mich., Detroit—Apr. 1, by C. A. Gadd, bus. mgr. Bd. Educ., 1354 Broadway Ave., 2 story, basement, brick, steel, rein.-con., plain found., Linden and Lawton Aves. $175,000. Van Leyen, Schilling & Keough, 3440 Cass Ave., archts.

Mich., Detroit—Apr. 2, by C. A. Gadd, bus. mgr. Bd. Educ., 1354 Broadway Ave., 2 story, basement, brick, steel, rein.-con. school addition, plain found., Ogden and Arnold Aves. $161,000. Malcolmson, Higginbotham & Trout, 117 Griswold St., archts.

Minn., Windom—Apr. 7, by Bd. Educ., H. C. Beise, clk., 2 story, basement, rein.-con., brick, stone school. $150,000. George Pass & Son, and P. T. Rockey, Mankato, archts. Noted July 31.

Mo., Joplin—Mar. 31, by Bd. Educ., S. A. Harris, secy. (from selected list bidders) North Junior High School, 2 story, basement, brick, steel, rein.-con., Gray Ave. and 1st St. $250,000. T. W. Williamson & Co., Farmers Natl. Bank Bldg., Topeka, Kan., archt. B. F. Cook, 713 Linwood Blvd., Kansas City, engr. Noted Feb. 26.

N. J., Jersey City—Apr. 1, by Bd. Educ., Administration Bldg., 3 story, basement addition to Dickinson High School, Palisade Ave. $150,000. J. T. Rowland, Jr., 30 Veterans Sq., archt. Noted Feb. 12.

N. J., Perth Amboy—Church of Our Lady of Hungary, L. Horvath, pastor, 697 Cortland St., sketches by V. Eck, 155 Broad St., Red Bank, 2 story, basement, brick, steel, rein.-con. school, Cortland St. $150,000. Noted Mar. 19.

N. J., Teaneck (br. Hackensack)—Bd. Educ., High School, 2 story, basement, brick, steel, Garrison Ave. $200,000. Architect not selected. Project in abeyance. Noted Jan. 29.

N. Y., Annandale (sta. Staten Island)—Mar. 31, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., Brooklyn, general contract P. S. 36, Jefferson Blvd., between Ionia and Lamont Aves., for Bd. Educ., 500 Park Ave., New York. Noted May 15.

N. Y., Brooklyn—Mar. 31, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., general contract P. S. 229, Benson Ave. from 14th Ave. to Bay 7th St., for Bd. Educ., 500 Park Ave., New York. Noted May 15.

N. Y., Forks—F. Spangenberg, archt., 250 Delaware Ave., Buffalo, bids about Mar. 28, 3 story, 65 x 100 ft. and 62 x 100 ft. school, addition, incl. gymnasium, lockers, auditorium, for Union Free School Dist. 11. $200,000.

N. Y., Warwick—Apr. 2, by Dpt. Social Welfare, State Office Bldg., Albany, general contract 28 buildings, service connections at New York Training School for Boys. Noted Feb. 26.

O., Oakwood (br. Dayton)—Apr. 2, by Bd. Educ., Junior High School, 3 story, basement, brick, steel, concrete. $350,000. Schenck & Williams, 3rd Natl. Bank Bldg., Dayton, archts.

O., Oakwood—Apr. 2, by Schenck & Williams, archts., 3rd Natl. Bank Bldg., Dayton, 2 story, basement, brick, rein.-con. school, plain found., Far Hills Ave. $250,000. Noted Dec. 11.

Pa., Erie — Apr. 9, by Bd. Educ., S. W. Reichard, pres., Library Bldg., general and mechanical contracts Edison Elementary School, 2 story, 95 x 171 ft., brick, stone, fireproof, incl. gymnasium, East Lake Rd. and Bacon St. $185,000. Myers & Johnson, 821 Commerce Bldg., archts. Mayer & Valentine, Plymouth Bldg., Cleveland, O., engrs.

Wash., Seattle—F. A. Naramore, archt., 810 Dexter Ave., bids about May 13, 2 story, basement school, West 75th St. and 25th Ave. N.W., for School Dist. 1. $175,000.

CONTRACTS AWARDED

Calif., Los Angeles—Bd. Regents University of California, 405 Hilgard Ave., Westwood, general contract 3 story, basement, rein.-con. dormitory, to H. M. Baruch Corp., Lincoln Bldg., $180,525; plumbing, to Howe Bros., 1198 South San Pedro St., $16,978; heating and ventilating to Lohman Bros., 232 South Spring St., $20,355; electrical work to Newbury Electric Co., 626 South Olive St., $12,188. Grand total $230,046. Noted Nov. 13.

Conn., Hamden—Larson's Secretarial School, 291 Whitney Ave., New Haven, 3 story, basement, 50 x 105 ft., 2 story, basement 50 x 98 ft. school, gymnasium, cafeteria, all brick, stone, rein.-con., Whitney Ave. and Servoss St., to C. W. Murdock, Inc., 505 Grand St., New Haven. Est. $150,000.

D. C., Wash.—Dist. Comrs., District Bldg., general contract Hugh M. Brown Junior High School, to A. L. Smith, 2nd and T Sts., $418,873. Noted Feb. 25 Daily.

Fla., Winter Park—Rollins College, H. Holt, pres., Spanish design, colored stucco, artificial stone, hollow tile chapel, to G. Hessler, 111 West Ashley St., Jacksonville. Est. $200,000. Noted Mar. 5.

Kan., Arkansas City—Bd. Educ., C. E. St. John, supt., for Roosevelt School, 1 story, part basement, 69 x 160 ft., Lincoln School, 1 story, part basement, 60 x 210 ft., to Nolin Constr. Co., Arkansas City, $65,000; heating and plumbing, to Fouts Plumbing Co., Arkansas City, Ark., $18,273; electric wiring, to Schwartz Electric Co., Arkansas City, $1,494. Grand total $84,767.

Mass., Billerica — Town, C. H. Eames, chn. building comn., 2 story, basement, brick, stone school, plain found., to R. Clough, Chelmsford. Est. $150,000 or more. Noted Oct. 9.

Mass., Newton—Sacred Heart Roman Catholic Church, T. A. Curtin, Centre St., altering and constructing 2 story, basement, brick, stone, school addition, concrete found., to R. A. Vachon & Sons, Inc., 22 Union St., Newton Centre. Est. $150,000. Noted Mar. 5.

Mass., Waltham—St. Mary's Roman Catholic Parish, J. J. Baxter, pastor, 133 School St., altering and constructing 2 and 3 story, basement, brick school addition, plain found., to A. A. Walsh, 353 Moody St. Est. $150,000. Noted Mar. 12.

Mo., Clayton—Bd. Educ., c/o J. J. Bracken, 7500 Maryland Ave., general contract altering and constructing addition Glenridge, and Bellevue Schools, to M. I. Fleischer, Ry. Exchange Bldg., St. Louis, $110,000 and $78,000 respectively; electrical work, to H. P. Faig, 2806 North 11th St., St. Louis—heating in Glenridge School, to Elliott & Barry Eng. Co., 4060 West Pine Blvd., St. Louis; plumbing same school, to W. L. Clucas, 1 North Grand Blvd., St. Louis; heating Belleville School, to St. Louis Heating & Eng. Co., 1417 Olive St., St. Louis; plumbing in same school, to C. O. Smith Plumbing Co., 4025 Forest Park Ave., St. Louis. Est. $188,000. Noted Feb. 26.

N. H., Exeter—Phillips Exeter Academy, L. Perry, principal, two 2 story basement, brick, stone wings, plain founds., to L. H. Shattuck, Inc., 208 Granite St., Manchester. Est. $150,000 or more. Noted Feb. 10.

N. J., Trenton—State Bd. Educ., State House, general contract 2 story, basement, brick, steel addition to Teachers College, to G. H. Evans, Inc., 1416 Vine St., Phila., Pa., $254,254. Noted Mar. 5.

O., Boardman—Bd. Educ., 3 story, basement, 137 x 164 ft., brick, steel, concrete high school, to Wendling Bros., Wooster Rd., Dover, $115,000. Noted Feb. 19.

Pa., Brentwood—Ed. Educ., C. H. Brecken, secy., 3108 Brownsville Rd., general contract Junior and Senior High School, 3 story, basement, 139 x 165 ft., brick, limestone, incl. auditorium, gymnasium, to Davis Smith Co., Real Estate Savings & Trust Bldg., N. S. Pittsburgh; plumbing, to Moss & Blakeley, Climax St. and Beltzhoover Ave., Pittsburgh. Est. $250,000. Noted Feb. 5.

R. I., Middletown—Howe & Church, archts., Turks Head Bldg., Providence, 2 story, 80x85 ft., brick infirmary unit, to J. W. Bishop Co., Turks Head Bldg., Providence, for St. George's School, Newport. Est. $150,000. Noted Mar. 12.

Tex., San Antonio — Society of Mary, c/o J. Waldron, St. Marys Academy, 112 College St., and 3023 Cote Brilliante Ave., St. Louis, Mo., general contract (except found. which is already completed), 3 story, basement, brick, rein.-con., structural steel school, to McKenzie Constr. Co., Smith-Young Tower, $275,000. Noted Jan. 22.

Va., Charlottesville—Architectural Comn., J. K. Peebles, chn., for W. A. Clark Law Building, 2 story, basement, 200 x 200 ft., brick, steel, cut stone, concrete, to Johnson Constr. Co., Norfolk, for University of Virginia. $271,567. Noted Mar. 5.

Ont., St. Catharines — Ridley College, St. Catharines, brick, stone, concrete, steel, dormitory and masters buildings in connection with extension program at college, to Wilde & Brydon, Canadian Pacific Ry. Bldg., Toronto, $150,000. Total $500,000. Noted Jan. 22.

Ont., Toronto—Mathers & Holdenby, archts., 96 Bloor St., W., 3 story, basement, 123 x 142 ft., rein.-con. ,stone Botany building, to Auglin-Norcross Ltd., Temple Bldg., greenhouses, to Lord & Burnham, Harbor Bldg.; heating, to H. Griffith & Co., 1128 College St.; electrical work, to Ontario Electric Constr. Co., Confederation Life Bldg., for University of Toronto, Queen's Park. Est. $400,000. Noted Jan. 22.

THEATRES

PROPOSED WORK

Calif., Glendale—Davis-Glendale Co., c/o A. F. Priest, Fay Bldg., Los Angeles, 165 x 260 ft., rein.-con. theatre. $150,000.

Ont., Ottawa—Triangle Amusement Co., P. J. Nolan, pres., 263 Clemow Ave., plans by D. J. Creighton, 3641 Oxenden St., Montreal, Que., 3 story, basement, brick, steel, stone, concrete theatre, 1,600 seating capacity. $300,000.

CONTRACTS AWARDED

Mass., Lawrence—Salem Realty Co., J. Deery, 71 Washington St., Salem, 1 story theatre, 1 story store, and 6 story office building, brick, steel, to C. S. Cunningham & Sons, Statler Bldg., Boston. Est. $1,000,000. Paramount Theatre Corp., Paramount Bldg., New York, lessee. Noted June 26.

N. Y., New York—Todd Robertson & Todd Eng. Co., 347 Madison Ave., awarded contract steel and erection for 10 buildings for Metropolitan Square (Radio City), to Post & McCord, 101 Park Ave. Post & McCord awarded contract for furnishing 125,000 tons structural steel to American Bridge Co., 30 Church St. for Metropolitan Square Corp., 61 Bway., est. $10,000,000. Noted Mar. 19.

O., Fostoria—Paramount-Publix Theatres, Inc., S. Katz, pres., Paramount Bldg., 43rd St. and Bway, New York, 2 story, basement, 100x150 ft., brick, steel, concrete theatre and commercial building, to A. Krinsky, 1060 East 99th St. Est. $150,000.

BANKS

PROPOSED WORK

Mass., Boston — Boston Five Cent Savings Bank, 30 School St., branch bank, West Roxbury Sect. $150,000 or more. Architect not selected.

BIDS ASKED

O., Zanesville—Directors First National Bank bids about Apr. 10, 6 story, basement, brick bank, office, 422-424 Main St. $250,000.

CONTRACTS AWARDED

N. Y., Nyack—Nyack National Bank, bank, to W. A. Berbusse, Crooked Hill Rd., Port Onester. Est. $150,000. Noted Mar. 12.

OFFICES

PROPOSED WORK

Conn., New Canaan—See "Stores."

N. Y., Jamaica—S. R. Smith Corp., 9050 Parsons Blvd., 10 story, 55 x 140 ft. office, store, 161st St. and Jamaica Ave. $400,000.

N. Y., New York—New York Stock Exchange, 11 Wall St., sketches by Cross & Cross, 385 Madison Ave., stock exchange addition, office, 20 Broad St. $10,000,000.

N. Y., New York — Henry Mandel, 10 East 40th St., sketches by Farrar & Watmouth, 10 East 40th St., 46 story, office, Park Ave. and 40th St. To exceed $5,000,000.

O., Cincinnati—See "Waterworks."

STORES

PROPOSED WORK

Calif., Los Angeles—May Co., 9th and Bway., sketches over 7 story department store, Hollywood Blvd. and Wilcox Ave. To exceed $150,000.

Conn., New Canaan—Village Impvt. Co., J. Carl, Railroad Ave., plans by A. Mausoloff, Valley Rd., 2 story, 75 x 115 ft., brick, steel store, office, Railroad Ave. $125,000-$150,000.

N. J., Newark—P. J. Hoey, 166 Montague St., Brooklyn, N. Y., rejected bids 1 and 2 story, basement, 95 x 330 ft., brick, steel store, swimming pool, 235-9 Clinton Ave. $150,000. Project in abeyance. F. Grad, 1023 Broad St.

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Stores (Continued)
archt. Noted Jan. 22 under "Contracts Awarded."

N. J., Newark—One Thousand Fourteen Broad Street Corp., A. M. Slavitt & D. Cronheim, 39 Branford Pl., plans by Bottelli & Bottelli, 45 Branford Pl., 3 story, basement store, loft, 1014 Broad St. $150,000. Noted Mar. 5.

N. Y., Forest Hills—El Walt Realty Co., 698 Empire Bldg., Brooklyn, plans by B. Braunstein, 163-18 Jamaica Ave., Jamaica, 6 story, basement, 91 x 265 ft. store, apartment, Ascan Ave. and Austin St. $500,000.

N. Y., New York—H. E. Mitler, 505 5th Ave., stores, apartment, 331 West 57th St. To exceed $1,000,000. **Maturity indefinite.**

BIDS ASKED

Conn., Waterbury—Grieve Bisset & Holland, Inc., 21 North Main St., taking bids altering and constructing 2 story, basement, 80 x 90 ft., brick, steel, concrete addition, North Main and Phoenix Sts. $150,000. W. E. Hunt, 182 Church St., Torrington, archt. Noted Feb. 5.

Ind., South Bend—Brown Bros., c/o Freyermuth & Maurer, 107 Lincolnway E., taking bids 67 x 165 ft. brick, steel, stone store, Main St. and Western Ave. $150,000.

CONTRACTS AWARDED

Mass., Cambridge—See "Residential."

N. J., Union—M. Eberle, c/o W. E. Lehman, archt., 972 Broad St., Newark, general contract 2 story, basement, brick, steel store, apartment, Melrose Parkway and Stuyvesant Ave., to Fatzler Co., 11 Hill St., Newark. Est. $150,000.

Pa., Pittsburgh—Janssen & Cocken, archts., Century Bldg., 4 story, basement, 20 x 80 ft., brick, limestone, fireproof store, loft, 443 Wood St., also wrecking present building on site, to W. T. Grange Constr. Co., Keenan Bldg., for Singer Sewing Machine Co., W. H. Clough, in charge buildings, 149 Bway., New York. Est. $150,000. Noted Mar. 12.

LOFTS

PROPOSED WORK

N. J., Plainfield—Mid-City Trust Co., 201 Front St., bids late in April, 2 story, basement, 40x150 ft., brick, steel, plain found., Watchung Ave. and East Front St. $200,000. **Maturity indefinite.** Holmes & Winslow, 153 East 38th St., New York, archts. Noted Mar. 12.

BIDS ASKED

Ill., Chicago—Leichenko & Esser, archt., 38 South Dearborn St., taking new bids 135x145 ft., rein.-con., stone loft building, incl. stores, 3129-41 Lincoln Ave., for S. H. Goldberg, 20th St. and Prairie Ave. $400,000. Former bids rejected. Noted Nov. 13.

PUBLIC

PROPOSED WORK

Conn., Newtown—INSANE ASYLUM—State, Fairfield State Hospital, N. G. Osborn, New Haven, plans by W. F. Crabtree, 401 Asylum St., Hartford, 2nd group of 8 or 10 buildings for new insane asylum, incl. hospital buildings, nurses home, employees dormitories and staff buildings, all brick, steel. $1,250,000.

Conn., Washington—TOWN HALL—Bryan Memorial Trust, Town Hall, bids late in April, general contract 1 and 2 story, 120x120 ft., 2 wings, brick, stone. $150,000. C. Clark, 101 Park Ave., New York, archt. Noted Dec. 11.

Ind., Indianapolis—LIBRARY—State of Indiana, Library Comm., L. J. Bailey, secy., State House, plans by A. Bohn, 215 East 32nd St., sketches State Library and Historical Building, Senate and Ohio Sts. $1,000,000 appropriated. Architect not selected.

La., New Orleans—MARKETS—Comm. Council plans by S. Stone, Jr., Masonic Temple, rebuilding, modernizing 7 markets, Dryades, Melpomene, Suburban, Ewing, Foto and Magazine Sts., St. Bernard and Jefferson Aves. $900,000. Noted Jan. 15.

Mass., Boston—FIRE STATION—City, Fire Dpt., Bristol St., sketches by H. H. Atwood, 61 Albans St., Dorchester, 2 story, basement, brick, steel, near Lois Pasteur Ave., Back Bay Sect. $175,000.

Mass., Charlestown (Sta. Boston)—MUNICIPAL—City of Boston, Dpt. P. Buildings, State House, Boston, municipal building, Lexington and Bunker Hill Sts. $400,000. Architect not selected.

Mass., Greenfield—COURT HOUSE—Franklin Co. Comn., H. E. Adams, clk., sketches by E. G. and G. C. Gardner and F. W. S. King, 33 Lyman St., Springfield, brick, stone, Main and Hope Sts. $200,000. Noted Feb. 12.

Mass., Newton—POLICE STATION—City, 2 story, basement, brick, steel police station, plain found., Washington St. $150,000. J. H. Ritchie & Associates, 250 Stuart St., Boston, Project in abeyance. Noted Feb. 5.

Mass., Rockland—MUNICIPAL—Town, H. S. Torrey, chn. Bd.—Selectmen, municipal building. $150,000 or more. Architect not selected.

Mass., South Boston (sta. Boston)—FIRE STATION—City, Fire Dpt., Bristol St., sketches by H. H. Atwood, 61 Albany St., Dorchester, 2 story, basement, brick, steel, near Broadway and L St., City Point. $175,000 appropriated. Noted Feb. 26.

Mass., Sudbury—TOWN HALL—Town, H. N. Fairbanks, chn. building com., sketches by C. H. Way, 6 Beacon St., Boston, 2 story, basement, brick, concrete found., Main St. $150,000. Noted July 31.

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Mo., St. Louis—MUSEUM—Bd. P. Serv., City Hall, sketches by W. P. Manske & Assoc., 4064 Olive St., 5 story, basement, brick, concrete, stone, for St. Louis Museum of National History, 12th Blvd., 13th, Pine and Chestnut Sts. $2,500,000.

N. J., Bayonne—FIRE HOUSE and POLICE STATION—Bd. City Comrs., City Hall, 2 story, basement, brick, steel. $150,000. **Maturity probably soon.** Architect not selected.

N. J., Rutherford—MUNICIPAL—Bd. Boro Council, Boro Hall, 2 story, basement, brick, steel municipal building. $150,000. Architect not selected. **Maturity probably soon.**

N. J., Tenafly — BORO HALL — Bd. Boro Council will not build 2 story, basement, brick, steel addition. $150,000. Project abandoned. Noted Feb. 26.

N. Y., Brooklyn—HEALTH CENTER—Dpt. Health, 505 Pearl St., health center, baby clinic, laboratory. $150,000. **Maturity indefinite.** Architect not selected.

N. Y., Jamaica—HEALTH CENTER—Dpt. Health, Pearl St., New York, health center, dental laboratory, baby clinic. $150,000. **Maturity indefinite.**

N. Y., New York—HEALTH CENTER—Dpt. Health, 505 Pearl St., bids in June, baby health center, dental and X-ray laboratory, 349 East 14th St. $150,000. K. Murchison, 101 Park Ave., archt.

BIDS ASKED

Calif., San Luis Obispo—DORMITORY—Apr. 8, by State Dpt. P. Wks., Div. Architecture, State Office Bldg., Sacramento, 2 story, boys domitory, 6,700 sq.ft. floor space. Noted May 22.

Ind., Evansville — LIBRARY — Apr. 2, by Evansville Library Bd., 4 story, basement, rein.-con., brick, stone. $300,000. Walker & Weeks, 2341 Carnegie St., Cleveland, O., archts. Noted Feb. 12.

N. J., Caldwell — BORO HALL — Bd. Boro Council, Boro Hall, bids about June 1, 2 story, basement, brick, steel. $200,000. Guilbert & Betelle, 20 Branford Pl., Newark, archts. Noted Mar. 5.

Wyo., Laramie—COURT HOUSE—Apr. 6, by Bd. Comrs. Albany Co. 3 story court house. $225,000. W. Dubois, Hynds Bldg., Denver, Colo., archt. Noted Jan. 29.

CONTRACTS AWARDED

Mass., Stoneham—LIBRARY—Town, H. H. Richardson, Town Hall, altering and constructing 2 story, basement, brick, limestone addition, plain found., to R. L. McPhail, 30 Falkner Terrace, Brighton. Est. $150,000. Noted Feb. 26.

Mich., Mount Clemens — COURT HOUSE — Macomb Co., I. A. Hartung, clk., 12 story, basement, brick, steel, rein-con., plain found., to Otto Misch Co., 159 East Columbia St., Detroit; heating, to F. J. Hatzenduhler, Mt. Clemens; Est. $600,000. Noted Feb. 19.

Minn., Red Wing—COURT HOUSE—Goodhue Co., C. T. Taylor, aud., general contract 3 story, basement, 102x138 ft., rein.-con., brick, steam heating, etc., to Standard Constr. Co., 1111 Plymouth Bldg., Minneapolis, $166,263. Noted Jan. 22.

N. J., Jersey City—HALL of RECORDS—Hudson Co., Court House, grading, excavating site of old county jail for preparation work for new Hall of Records Building, to E. M. Johnson, 706 Bergen Ave., at $0.23 per cu.yd. excav. and grading, $900 for fencing. Noted Mar. 9 Daily.

N. Y., Buffalo—FIRE STATION—G. Frisk, comr. P. Wks., general contract fire house, Staats and 7th Sts., to G. W. Morris Corp., Ellicott Sq., $232,450; heating, to Barnett Bros., 82 Geary St., $20,222; electrical work, to Reinagel Electric Co., 53 Allen St., $9,999; plumbing to Batt Co., 955 Michigan Ave., $16,975; concrete walks, pavements, to A. Cervi Corp., 85 Roma Ave., $5,888. Grand total $285,534. Noted Jan. 29.

N. Y., Buffalo—OFFICE—Superintendent P. Wks., Albany, construction work State Office Building, to E. F. Hauserman, 399 State St., Albany, $37,516: bronze and marble, to Newman Mfg. Co., 346 Elliott Sq., $8,170. Noted Dec. 12.

N. Y., New York—ARMORY—Armory Bd., J. Paul, secy., City Hall, general contract administration building for 369th Infantry to C. and W. Constr. Co., Columbus Ave. and 77th St., $724,000; plumbing, to J. W. Kandel, 992 2nd Ave., $53,545; heating, to Railser Heating Co., 129 Amsterdam Ave., $37,390. Grand total, $814,935. Noted Mar. 5.

Tex., Menard — COURT HOUSE and JAIL — Menard Co., c/o J. W. Matthews, judge, Menard, general contract 4 story, 80 x 104 ft. monolithic concrete, to E. D. Porter, San Angelo. $75,274 (on revised bid). Est. $150,000. Noted Feb. 19.

UNCLASSIFIED

PROPOSED WORK

Calif., Los Angeles—MARKET and OFFICE—C. B. McMille, 2 story, 140 x 210 ft., brick, Adams and Vermont Sts., Cooper Co., Western Pacific Bldg. $150,000.

Calif., San Francisco—HOME—Lick Old Ladies Home, c/o Coffey & Rist, Phelan Bldg., 2 and 3 story, rein.-con. home, University Ave. $250,000.

Conn., Noroton—HOME—Fitche's Soldiers Home, Noroton Heights, R. F. Gates, secy. Veterans Home Comn., Hartford, reduced appropriation from $2,500,000 to $1,300,000 for soldier's home and will probably construct same in another part of state. Site and architect not selected. Noted Dec. 25.

Md., Baltimore—AUDITORIUM—B. Evander, archt., 20 East Lexington St., soon lets contract altering and constructing brick, steel, concrete addition, 1207-15 North Charles St., for Tall Cedars Building Corp., 1207-15 North Charles St. $175,000. H. F. Doeleman, Baltimore Trust Bldg., engr. Noted Feb. 19.

O., Cleveland—AUTO SALES, etc.—W. M. Bateman, 5403 Prospect Ave., 2 story, basement, 113 x 130 ft., brick, steel, concrete auto sales and service building, East 83rd St. and Carnegie Ave. $150,000. Architect not selected.

Tex., San Antonio — BUSINESS CENTER — H. C. Thorman, et al, Western Natl. Bldg., plans by H. Steinbomer, Western Natl. Bldg., concrete block, stucoo, Spanish type, incl. 24 store spaces, ice house, filling station. $150,000—$200,000. Owner may build by day labor. Noted Mar. 5.

BIDS ASKED

Calif., San Francisco — WAR MEMORIAL OPERA HOUSE, etc.—Bd. Trustees San Francisco War Memorial bids about Apr. 22, concrete, terra cotta, brick, cast stone, granite work for American Legion and Opera House units in Civic Center, for City and San Francisco Co. Total $2,500,000 each.

Conn., Greenwich—CONVALESCENT HOME—Mar. 28, by St. Luke's Convalescent Home, C. F. Glover, supt., 2 story, basement, 50 x 90 ft., brick, cast stone, steel convalescent home for children, King St. $150,000. W. S. Gregory, 180 Madison Ave., New York, archt. L. E. Eden, 101 Park Ave., New York, engr. Noted Mar. 12.

Ill., Peoria—HOME—Mar. 30, by Christian Buehler Memorial, 103 West High St., c/o E. J. Cashin, Old Peoples Home, 3 story, basement, 150 x 200 ft., rein.-con. brick, plain found., Sheridan St. $200,000. H. B. Dox, Lehmann Bldg., archt. Noted Nov. 13.

CONTRACTS AWARDED

Conn., New Britain—HOME—Jerome Home for Aged, C. N. Stanley, pres., 2 and 3 story, brick, rein.-con. addition, to Allyn Wadhams Co., 15 Lewis St., Hartford, $126,642. Noted Feb. 5.

Conn., Westport—EXCHANGE—Southern New England Telephone Co., 157 Church St., New Haven, 3 story, 65 x 70 ft., brick, stone, Post Rd. and Myrtle St., to Hewlett Co., 886 Main St., Bridgeport. Est. $200,000.

N. Y., Buffalo—EXCHANGE—New York Bell Telephone Co., 44 Church St., general contract telephone exchange, to Turner Constr. Co., 11 Goodell St. Noted Feb. 26.

Industrial Buildings

FACTORIES AND MILLS

PROPOSED WORK

Ala., Birmingham—MANUFACTURING—J. D. Stokely, 1st Natl. Bank Bldg., plans by D. O. Whildin, 525 North 21st St., 3 story, basement, 60 x 128 ft., soft drink manufacturing plant, rein.-con., concrete. $60,000.

Calif., Los Angeles — COKE PLANT — Fields Chemical Corp., 122 Financial Center Bldg., sketches metallurgical coke plant, 1st unit to have capacity 20 tons per day.

Conn., Waterbury — FACTORY — Waterbury Buckle Co., South Main St., 4 story, 70 x 112 ft., brick, South Main St. $100,000. J. DeLauritis, 440 Pine St., archt. Project in abeyance. Noted Sept. 25.

Ia., Sioux City — DAIRY PLANT — G. B. Hilgers, United Bank Bldg., soon lets contract 1 and part 2 story, 160 sq.ft. floor space, rein.-con., quarry tile, plain found., 9th and Omaha Sts., for Roberts Dairy Co., D. E. Roberts, genl. mgr., 809 Douglas St. $100,000. Noted Feb. 5.

Me., Portland—FACTORY—Cushman Baking Co., N. Cushman, 105 Elm St., plans by Webster & Libby, 443 Congress St., altering and constructing 2 story, brick addition. $40,000.

Mass., Athol—Athol Gas & Electric Co., Main St., substation, Old Main St. $40,000 or more. Private plans. **Maturity indefinite.**

N. J., Jersey City—PLANT—Montgomery Cylinder & Grinding Co., 678 Montgomery St., 2 story, basement, brick, steel auto engine and remodeling plant, Tonnell Ave. and Allen St. $40,000. Architect not selected.

N. Y., Endicott—FACTORY—International Business Machines Corp., Endicott, and 270 Bway., New York, plans by C. Higgins, 101 Park Ave., New York, 4 story, 50 x 56 ft. addition. $100,000. Noted Mar. 5.

N. Y., New York—REFRIGERATION PLANT—Dpt. Hospitals, Municipal Bldg., bids early in May, general contract refrigeration plant, Randalls Island. $40,000. Van Wart & Wein, 347 Madison Ave., archts. Noted Jan. 1.

O., Cleveland—FACTORY—Industrial Rayon Corp., H. S. Rivitz, pres., West 98th St. and Walford Ave., plans by Christian, Schwarzenberg & Gaede, engrs. and archts., 1836 Euclid Ave., brick, steel, Walford Ave. To exceed $50,000.

Pa., Corry—FACTORY—Standard Automatic Products Co., L. T. McElroy genl. mgr., 611 West Main St., sketches 1 story, brick, steel, Main St. $40,000. **Maturity about June 1.** Architect not selected.

Pa., Oil City—MANUFACTURING PLANT—Oil City Boiler Wks., addition. $50,000.

Factories and Mills (Continued)

Pa., Uniontown — SHIRT FACTORY — H. W. Altman, archt., 306 Favette Title & Trust Bldg., soon lets contract 2 story, 75 x 320 ft., brick, tile, steel, for Industrial Corp., W. Miller, pres. $150,000. M. Berkowitz, 1261 Bway., New York, lessee. Noted July 10.

Tex., Raymondville—PACKING PLANT — American Fruit Growers Assn., c/o L. E. Snavely Valley Mgr., Harlingen, soon lets contract 1 story, brick, rein.-con., rein.-con. found. Private plans

Tex., Temple—MANUFACTURING—Day-Nite Sign Serv., Inc., 824 North 2nd St., 60 x 120 ft., all metal sign manufacturing plant, 150 daily capacity, incl. complete system metal and pipe bending wrought iron equipment, Balls—galvanized on black iron 5 in., beads, crystallized glass. $60,000. Private plans.

B. C. Vancouver — STEEL FABRICATING PLANT—Western Bridge Co. Ltd., 1st Ave., and Columbia St., reconstructing structural steel and bridge fabricating plant, at False Creek. $500,000. Private plans.

BIDS ASKED

La., Baton Rouge—CREAMERY—Mar. 31, by Weiss, Dreyfus & Seifer, archts., Maison Blanche Bldg., New Orleans, 2 story, rein.-con., brick, concrete, tile, rein.-con. found., for Louisiana Creamery Co., Inc. $50,000.

N. J., New Brunswick—BAKERY PLANT—Mar. 27, by A. Villa, 182 Remsen Ave., general contract 2 story, basement, 30x100 ft., brick, steel, Livingston Ave. $40,000. H. G. Bach, 63 Schurman St., archt. Noted Mar. 12.

N. Y., Sonyea—BAKERY—Apr. 15, by Dpt. Mental Hygiene, State Office Bldg., Albany, bakery, Craig Colony; adv. E. N.-R. Mar. 26.

Pa., Pittsburgh — FACTORY — P. Tinker & Sons, 5665 Butler St. taking bids brick, steel 5600 block Butler St. $40,000. R. M. Reutti, 5941 Baum Blvd., archt.

R. I., East Providence (br. Providence)—FACTORY—Mar. 28, by Eveready Cleansers & Dyers, 205 Cranston Ave., Providence, 2 story, brick, concrete. $40,000. A. O. Kurze, c/o owners, archt.

Tex., Henderson—GASOLINE PLANT—See "Contracts Awarded."

Wash., Seattle—FACTORY—Bates Valve Bag Co., R. S. Brown, mgr., Pacific Northwest Bldg., bids 1 story, basement factory, 22,000 sq.ft. floor space, 625 West Spokane St. $80,000.

CONTRACTS AWARDED

Calif., Oakland—FACTORY—Blue Bird Potato Chips, Inc., 68th Ave. and Beck St., 1 story, rein.-con., 81st St., to A. A. Haskell, 265 Ridgeway Ave., $28,876. Noted Sept. 18.

Ind., Hammond—FACTORY—Standard Steel Special Co., general contract 1 story, basement, 50 x 200 ft., rein.-con., brick, steel addition, Clark Ave. and 142nd St., to F. C. Rowley, 1st Trust Bldg., Hammond. Est. $42,000.

Mass., Wellfleet — FACTORY — Powdrell & Alexander Inc., 175 Connecticut Mills Ave., Danielson, 2 story, brick, plain found., day labor. $40,000. W. B. Brennan, 175 Connecticut Mills Ave., Danielson, engr. Noted Dec. 25.

Miss., Natchez — FACTORY — Mississippi Match Co., factory, incl. main building, 2 warehouses, garage, chlorate building, oil house, gate house, trucking tracks, to T. Wilmouth, Camden, Ark., $107,934. Noted Mar. 19.

N. J., Freehold — RUG MILL — A. and M. Karagheusian Co., Inc., Jackson St., general contract 3 story, basement, 86 x 87 ft., brick, steel addition, to W. Steele & Sons Co., 15th and Cherry Sts., Phila., Pa. Est. $40,000.

N. J., Montclair—FACTORY—G. H. Nash, 44 Walnut Crescent, general contract 1 story, basement, brick, steel, to S. E. Van Zandt, 86 Gordonhurst Ave. Est. $40,000. Noted Mar. 5.

N. J., Newark—CANDLE PLANT—A. Gross & Co., Doremus Ave., general contract 1 story, basement, 85 x 100 ft., brick, steel, 652-70 Doremus Ave., to E. M. Waldron, Inc., 40 Park Pl. Est. $40,000.

N. J., Newark—PAINT PLANT—Grasselli Chemical Co., 256 Liverpool Pl., general contract altering and constructing 2 story, basement, brick, steel addition, Vanderpool St., to Fatzler Co., 11 Hill St. Est. $40,000. Noted Mar. 5.

O., Cleveland—FACTORY—United Impvt. Co., A. Tyroler, Swetland Bldg., 1 story, brick, steel, 60x103 ft. factory and office building, 4103 Carnegie Ave., to Dresser Co., The Arcade. Est. $40,000.

Pa., Pittsburgh—BAKERY—Baur Baking Co., K. E. Baur, pres., N. Mountry, mgr., 7418 Tioga St., 1 story, 32 x 105 ft., brick, tile, 7418 Tioga St., to H. G. Dunlap, 236 St. Clair St. Est. $40,000.

Tex., Henderson—GASOLINE PLANT—East Texas Refining Co., Henderson, and F. W. Buford, Tulsa, Okla., 5,000 bbl. gasoline plant, near here. $150,000. Owner builds. Most of work by day labor.

Tex., Tyler—REFINERY PLANT—Taylor Refinery Co., c/o G. L. Ramsey, furnishing two 20,000 bbl. and six 10,000 bbl. storage tanks, bubble towers, plate work and condenser boxes, for 15,000 bbl. refinery plant, to Wyatt Metal & Boiler Wks., West Dallas and Tyler, $60,000. Total est. $350,000.

Wash., Seattle—ASSEMBLY PLANT—Clinton Constr. Co., 923 Folsom St., San Francisco, Calif., 1,750 tons reinforcing steel, for assembly plant to C. O. Larson Steel Co., 4315 9th St. N. W., for Ford Motor Co., 3674 Schaefer Rd., Dearborn, Mich. Noted Feb. 12 under "Contracts Awarded."

Wash., Seattle—FACTORY—Elliott Bay Mill Co., 600 West Spokane St., 1 story, 140 x 148 ft., brick, steel, to Austin Co., 1611 Euclid Ave., Cleveland, O. Est. $60,000.

Wash., Seattle—FACTORY—Tea Garden Products Co., 3433 8th St., 3 story, basement, 90 x 132 ft., brick, steel concrete, to Austin Co., 16112 Euclid Ave., Cleveland, O. Est. $250,000.

Ont., Hamilton — FERTILIZER PLANT — Graselli Chemical Co., Ltd., Federal Bldg., Toronto, subsidiary of Canadian Industries Ltd., Atlas Bldg., Toronto, superphosphate fertilizer plant, to Anglin-Norcross Ltd., Temple Bldg., Toronto, $400,000.

Ont., New Toronto — CANNING PLANT — Campbell Soup Co., Ltd, 2nd and Market Sts., Camden, N. J., concrete, brick, steel, stone, to Anglin-Norcross Ltd., Temple Bldg., Toronto. Est. $300,000. Noted Dec. 18.

Ont., Sudbury—HOIST HOUSE, etc.—International Nickel Co., Sudbury, and 61 Wall St., New York, hoist house, steel head frame, Frond Mine, to Steel Constr. Co. Ltd., Welland. Est. exceeds $40,000.

GARAGES

PROPOSED WORK

Conn., New London—B. Bottinelli, Broad St., plans by A. G. Creighton, 140 State St., 1 story, 85 x 135 ft., brick, steel garage, Broad St. $40,000.

Mass., Lowell—Lowell Electric Light Corp., J. A. Hunnewell, pres., 35 Market St., 2 story, brick service building, Perry St. $125,000. New England Power Assn., 89 Broad St., Boston, engrs.

Mass., Malden (br. Boston)—Western Auto Parts Co., 182 Eastern Ave., plans by G. A. Cornet, 13 Central Ave., Lynn, altering and constructing 1 story, irregular sized, brick, stone, steel sales and service station addition, plain found., Eastern Ave. $40,000.

Mass., Nantucket—J. M. Cadrain, 7 Middle Pearl St., 1 story, 85 x 100 ft., concrete block service garage and showroom, Beach and Easton Sts. $40,000. Private plans.

Minn., Minneapolis—Bd. Educ., G. F. Womrath, bus. supt., plans by Bureau Buildings, Div. Design & Inspection, 1 story garage, 811 Northeast Bway. $45,000.

N. H., Milford—Souhegan Motor Co., c/o A. W. Osberg, archt., 795 Elm St., Manchester, 2 story, 50 x 105 ft., brick, rein.-con., steel public service garage, concrete found. $40,000.

N. Y., Jamaica—Wohlbro Impvt. Co., 149-27 Jamaica Ave., plans by A. McLean, 149-27 Jamaica Ave., 100 x 104 ft. service garage, auto laundry, Merrick Blvd. and 116th Ave. $40,000.

N. Y., New York—R. Gangi, 3978 Paulding Ave., soon takes bids general and separate contracts 3 story service garage, 225th St. and Paulding Ave. To exceed $50,000. F. J. Ross, 4200 White Plains Ave., archt. Noted Mar. 5.

Okla., Oklahoma City — H. M. Johnson, c/o 1st Natl. Bank Bldg., sketches 14 story auto hotel, 1st St. $800,000. Architect not selected.

BIDS ASKED

N. J., East Orange—Rocco Realty Co., M. Rousek, mgr., 507 Main St., bids about Apr. 15, general contract 2 story, basement, brick, steel, rein-con. auto laundry and garage, Main and North Arlington Sts. $150,000. Noted Mar. 12.

N. Y., Brooklyn—Dpt. Hospitals, Municipal Bldg., New York, bids about April 15, garage and mortuary, at Coney Island Hospital, Ocean Parkway and Avenue Z. $150,000, G. M. McCabe, 96 5th Ave., New York, archt. Noted Sept. 11.

CONTRACTS AWARDED

Conn., Bridgeport—Dugan Bros., Inc., Glenwood Ave., 1 story, 60x200 ft., brick, steel service building, to O. F. Burghart, 333 North Ave. Est. $60,000. Noted Mar. 5.

SHOPS AND FOUNDRIES

PROPOSED WORK

Mo., St. Louis — SHOP and FOUNDRY — Busch-Sulzer Bros., Diesel Engine Co., 3300 South 2nd St., soon lets contract 80 x 150 ft. and 80 x 90 ft., concrete, brick, steel, 3300 South 2nd St. W. J. Knight & Co., 903 Wainwright Bldg., engrs.

CONTRACTS AWARDED

Ind., South Bend—FOUNDRY—F. D. Chase, archt., 720 North Michigan Ave., Chicago, Ill., general contract 1 story, 80x100 ft., steel, brick, to Ralph Sollitt & Sons Co., South Bend, for Sibley Machine Wks.

N. Y., Hornell—SHOP, etc.—A. W. Brandt, comr. Albany, general contract repair shop and grading, to D. Elander, Inc., Jamestown, $63,497; heating, to M. G. Lippincott, Hornell, $11,884; plumbing, to F. W. Murtaugh Co., 10 Hobart St., Rochester, $4,989; electrical work, to Laverne M. Aber, Canisteo, $1,750. Grand total $82,120. Noted Mar. 5 Daily.

POWER PLANTS

PROPOSED WORK

Colo., Grand Junction — City Council, H. C. Tomlinson, clk., power plant. $750,000. Wood & Weber, 810 14th St., Denver, engr.

Ill., Chicago—Byllesby Eng. & Management Corp., 231 South La Salle St., H. Erickson, vice pres., announces that Standard Gas & Electric Company's construction budget for 1931 totalling $45,068,951 has been allocated among various subsidiary and affiliated companies as follows: California Oregon Power Co., $5,100,004, Louisville Gas and Electric Co., $3,100,066, Mountain States Power Co. $1,115,530, Northern States Power Co. $10,803,809, Oklahoma Gas and Electric Co., $3,577,502, San Diego Consolidated Gas & Electric Co., $2,271,060, Southern Colorado Power Co. $240,357, Wisconsin Public Service Corp., $1,508,245, Wisconsin Valley Electric Co., $1,027,474, Philadelphia Company, $14,028,096, other expenditures $2,296,808.

Ind., Anderson—Indiana R.R. an Insull subsidiary, 4 new power sub-stations complete with high tension line, also in market for many thousand feet copper wire. $400,000. Private plans.

Mass., Gardner—Commonwealth of Massachusetts, Gardner Mental Hospital, Dpt. Mental Diseases, Boston, plans by Albert B. Franklin, Inc., 25 Haverhill St., Boston, 2 story, brick, steel, concrete power generating plant, 150 ft. radial chimney, also turbines, 2 stokers and switchboard. $80,000. Noted Feb. 26.

Mo., Perryville—City, P. Zellers, mayor, preliminary surveys light and power plant, distribution system, generating equipment. Russell & Axon, 6200 Easton Ave., St. Louis, and 408 McDaniel Bldg., Springfield, engrs.

N. H., Exeter—Philips Exeter Academy, L. Perry, principal, and R. D. Kimball Co., engrs., 6 Beacon St., Boston, Mass., soon lets contract 1 story, brick, rein.-con., steel central heating plant, concrete, found. $40,000 or more.

N. Y., New York—BOILER ROOM—Tompkins Square Holding Corp., H. Siefke, pres., 2 West 45th St., plans by F. Straub, 147 4th Ave., altering boiler room, erecting walls, setting flues, 418 East 6th St. $40,000.

Okla., Vinita—Franchise election Apr. 21, electric power plant to Independent Power & Light Co. $150,000. Private plans.

BIDS ASKED

Calif., Burbank—City Council, F. S. Webster, clk., taking bids 1 story, 20 x 80 ft. brick, concrete sub-station.

Mass., Wellfleet—See "Contracts Awarded."

Minn., Duluth—Apr. 2, by R. J. Coole, Bd. Educ., boilers, stokers, chimney stack. $82,000.

N. Y., Brooklyn—Mar. 27, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, 2 substations, one at Jay St. between Concord and Nassau Sts., and other on Smith St., between 2nd and 3rd Pls.

CONTRACTS AWARDED

Kan., Kansas City—Bd. Pub. Utilities, C. A. Lowder, secy., furnishing, installing pumps for new power plant, to DeLaval Steam Turbine Co., 432 Dwight Bldg., Kansas City, Mo., $10,870. Noted Feb. 26.

Mass., Boston—City, Hospital Dpt., 1 story, brick electrical distribution centre for hospital buildings, Harrison Ave., to M. Cummings Co., 43 Tremont St. Est. $86,000.

WAREHOUSES

PROPOSED WORK

Ga., Savannah—Swift & Co., c/o Engineering Dpt., Packers and Exchange Aves., Chicago, Ill., soon takes bids 1 story, steel, corrugated iron warehouse, 309 West Broad St.

O., Cincinnati—Cincinnati Union Terminal Co., Temple Bar Bldg., 2 story, 70 x 780 ft., brick, rein.-con. warehouse, office, near Lincoln Park. $500,000. Private plans.

Wash., Seattle — Pacific Coast Steel Co., Youngstown Pl., 1 story, basement, 88 x 400 ft., steel warehouse, 4001 28th St. S. W. $40,000. Private plans.

Ont., Simcoe — Norfolk Fruit Growers Assn., Simco, 3 story, rein-con. fruit handling and cold storage plant addition. $100,000. E. H. Darling, Pigott Bldg., Hamilton, engr.

BIDS ASKED

Mass., Cambridge—See "Contracts Awarded."

CONTRACTS AWARDED

Ill., Cahokia—(south of East St. Louis)—Phillips Pipe Line Co., Bartlesville, 1 story, 72 x 148 ft., rein.-con., brick office, warehouse, 1 story, 60 x 103 ft. garage, to Austin Co., Arcade Bldg., St. Louis, Mo.

La., Lake Charles—Compress & Warehouse Co., four 110x200 ft. steel frame, warehouses (cotton), to Knapp & East, Lake Charles. Noted Mar. 19.

Mass., Boston—J. Wilkinson Co., 206 State St., altering 4 story, brick, storage building, 128-130 Oliver St., to J. C. Fraser & Sons Co., 294 Washington St. Est. $50,000.

Mass., Cambridge—W. H. Crane, 1 Hayward St., 1 story, 50 x 200 ft., brick, concrete storage building, plain found., Binney and Rogers Sts., separate contracts. Est. $45,000. Private plans. Noted Mar. 19.

N. J., Newark — New Jersey Bell Telephone Co., 540 Broad St., 6 story, basement, brick, steel warehouse, garage, Fabian Pl. and Loretta Ave. $250,000. Project in abeyance. Voorhees, Gmelin & Walker, 101 Park Ave., New York, archts. Noted Feb. 26.

Wis., South Milwaukee—Bucyrus Erie Co., general contract 2 story, 62 x 180 ft., brick, concrete warehouse, to Riesen Building Corp., 2218 North 3rd St., Milwaukee; sublet reinforcing steel and steel sash, to Truscon Steel Co., 230 Wisconsin Ave., Milwaukee; roofing, to Winding Roofing Co., 68 East Wisconsin Ave., Milwaukee; structural steel, to Milwaukee Bridge Co., 1410 34th St., Milwaukee.

See proposal advertising on page 98

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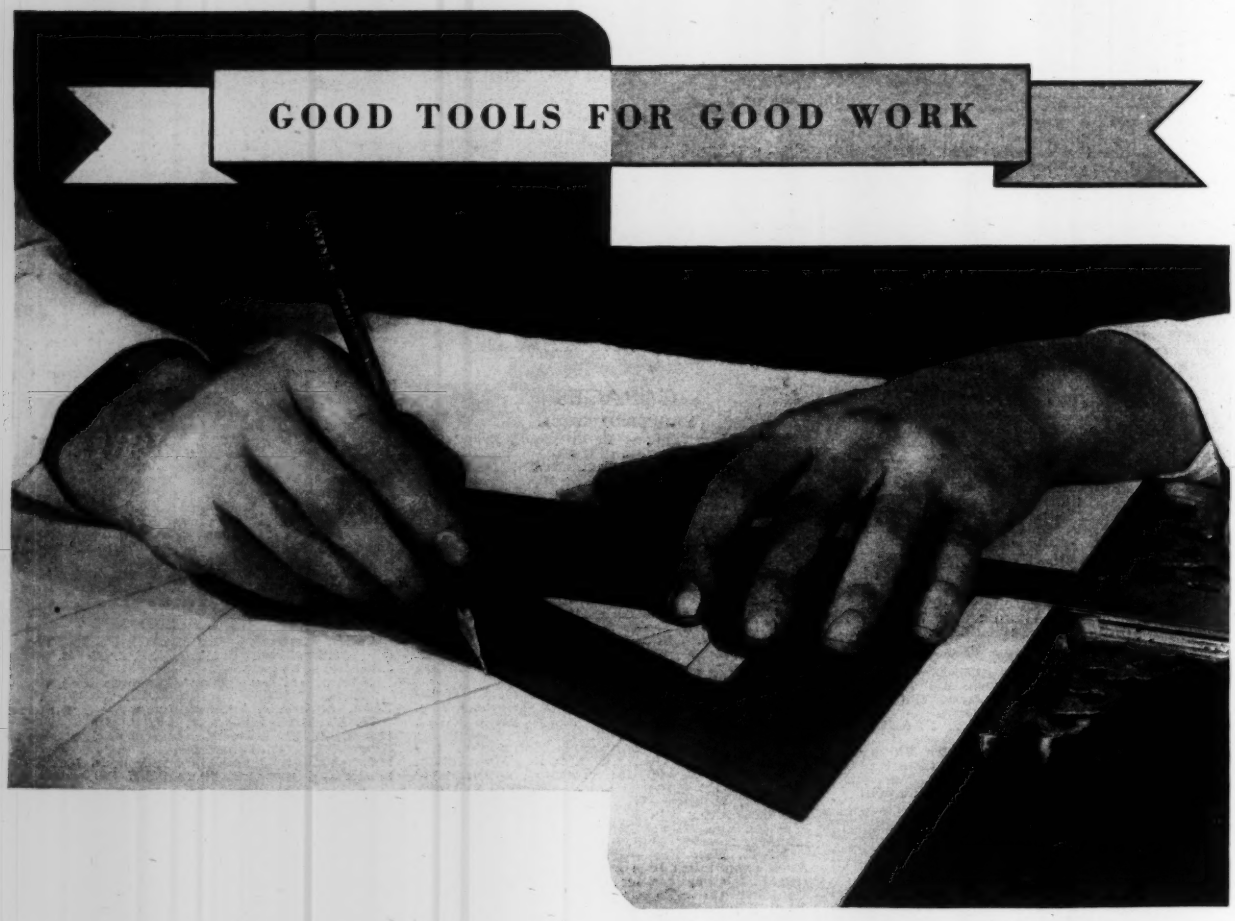

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